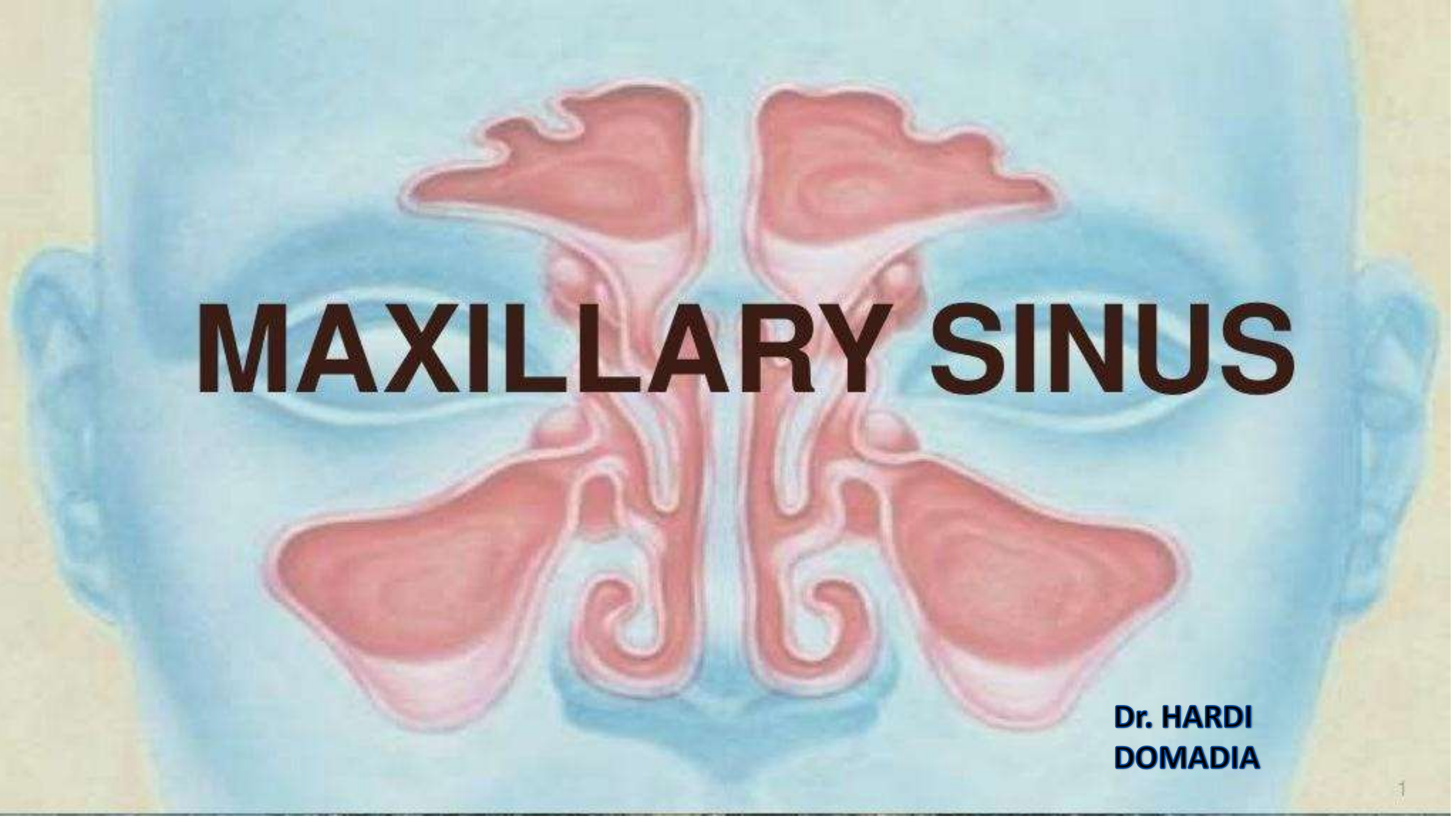


MAXILLARY SINUS

Dr. HARDI
DOMADIA

- Introduction
- Development, anatomy and physiology
- Blood , Nerve supply& Lymphatic drainage
- Functions of the paranasal sinuses
- Histology & Diagnostic evaluation of sinus disease
- Differences between odontalgia and sinus pain
- Developmental anomalies & pathologic conditions of maxillary sinus
- Clinical significance
- Case report
- Conclusion
- References

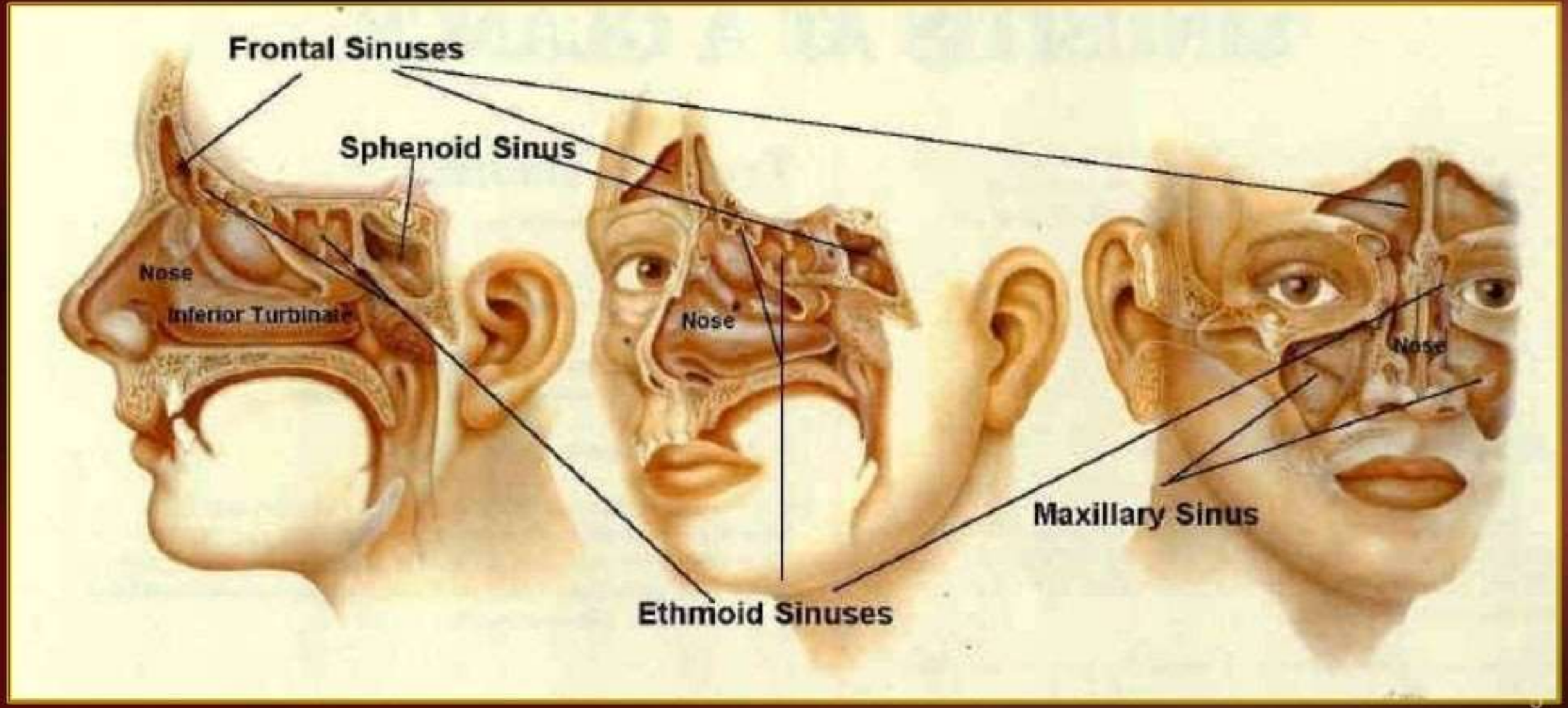
Paranasal air sinus

Introduction

- Paranasal air sinuses are the air filled mucosa lined cavities which develops in the cranial and facial bones.
- These are the spaces which communicates with the nasal airway.
- These forms the various boundaries of the nasal cavity.

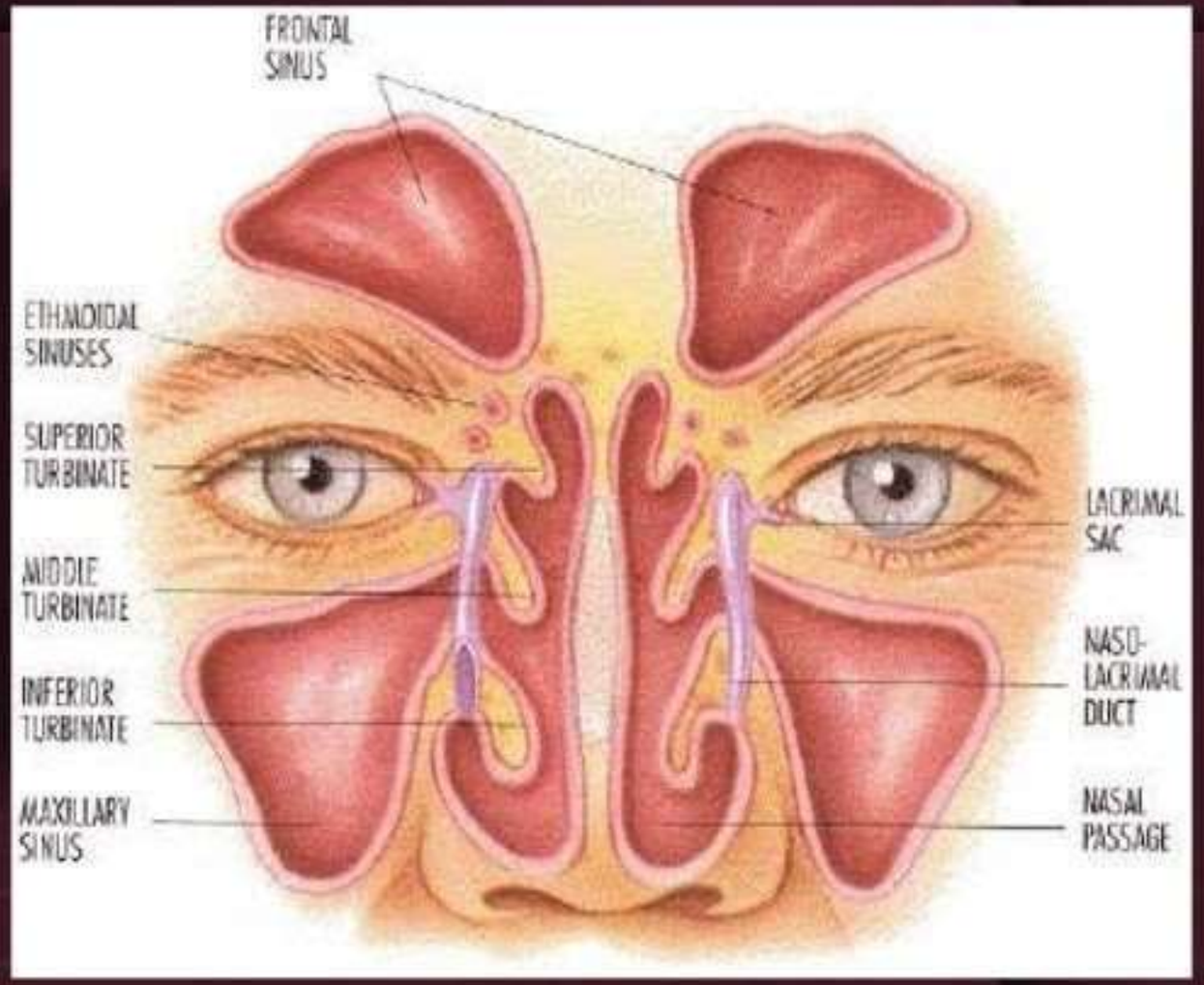
- The sinuses are named for the bones in which they are located.

- Paranasal sinuses are present in a variety of animals (including most mammals, birds, and crocodile).


Frontal Sinuses
Sphenoid Sinus
Nose
Inferior Turbinate
Nose
Nose
Maxillary Sinus
Ethmoid Sinuses

Introduction

- Maxillary air sinus
- Frontal air sinus
- Ethmoidal air sinus
- Sphenoidal air sinus



Definition of maxillary sinus

"Maxillary sinus is the pneumatic space that is lodged inside the body of maxilla and that communicates with the environment by way of the middle meatus and nasal vestibule."

Anatomy of the maxillary sinus was 1st described by Highmore in 1651.

Development

- Maxillary sinus is first of the PNS to develop.

- It starts as a shallow groove on the medial surface of maxilla during the 4th month of intrauterine life.

(Koch 1930).

- Expansion occurs more rapidly until all the permanent teeth have erupted.

- It reaches to maximum size around 18years of age.

(Bailey 1998, Sadler 1995)

AGE CHANGES

0-3 years

- Ovoid appearance
- 7 mm x 4mm x 4mm volume 6-8 ml
- 3rd year – ½ adult size

3-4 years

- ↑ in width with facial growth
- Position; 2nd deciduous molars and crypts of 1st permanent molars

7-9 years

- Dimensions 27 mm x 18 mm x 17 mm
- Volume10-12ml

9-12 years

- Antral floor same level with nasal floor
- Assumes pyramidal shape

12-18 years

- Floor of sinus 5–12.5 mm below nasal floor
- Dimensions 32-34 mm x 28-33 mm x 23-25 mm
- Volume 15-20 ml
- Floor i.r.t 1st and 2nd molars and 2nd premolar

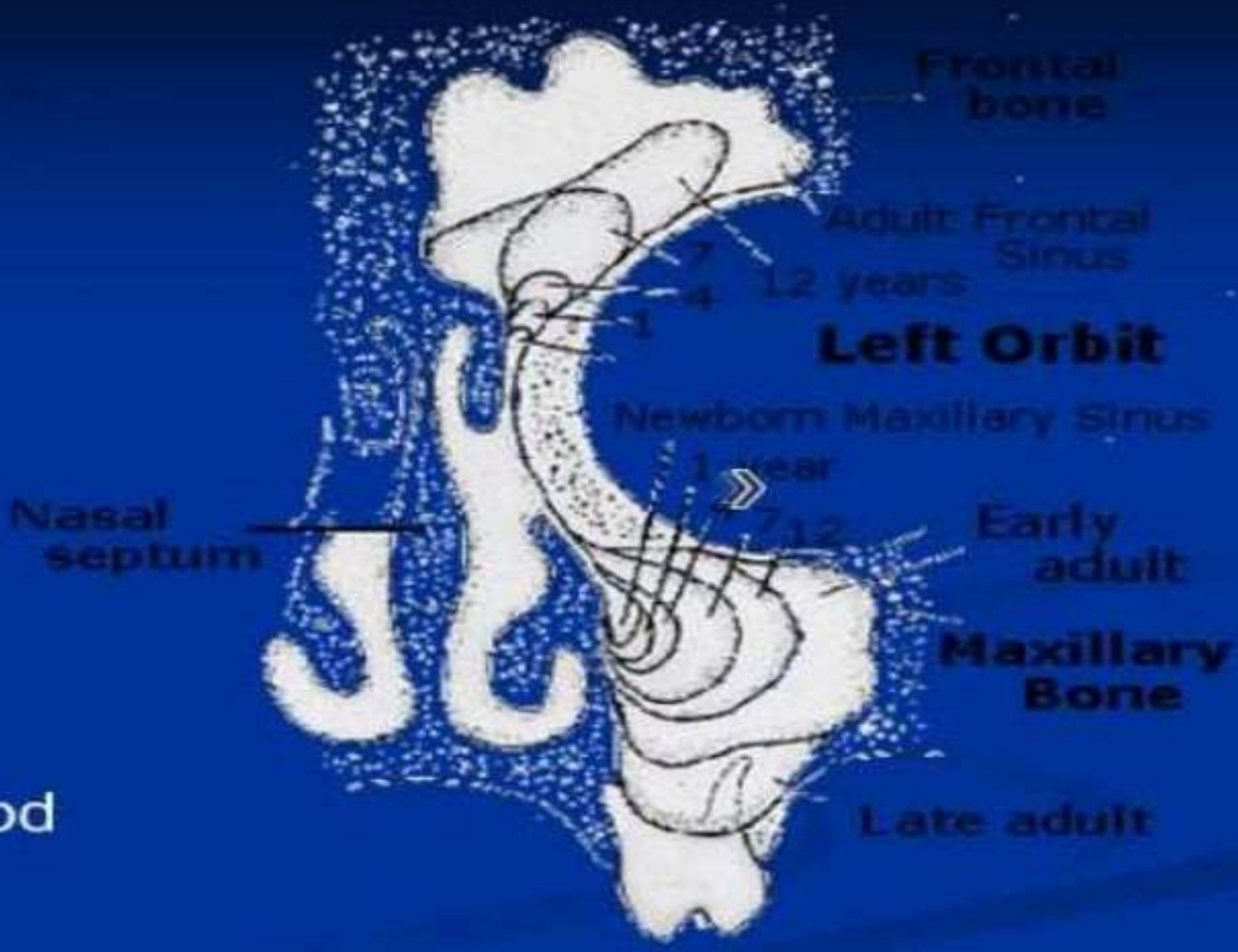
Old age

- Resorption of ridge – thinning of sinus wall
- Extension of sinus till crest
- Anterior & infratemporal surface reverts to infantile condition

Age changes

In its development maxillary sinus is:

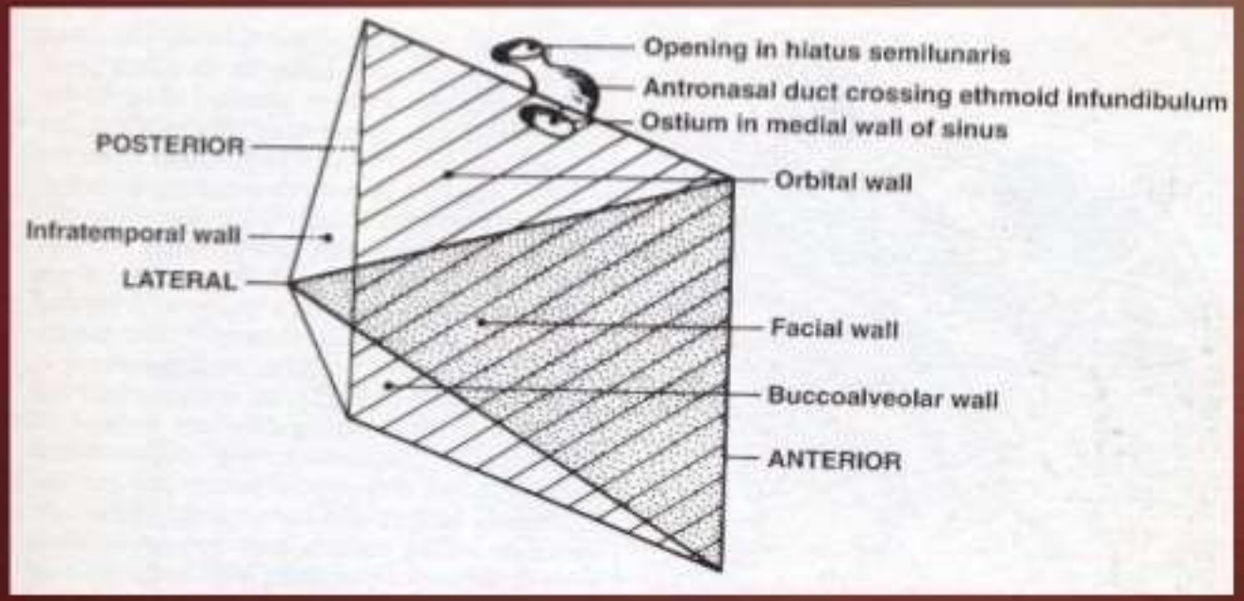
- Tubular at birth
- Ovoid in childhood
- Pyramidal in adulthood



Anatomy

- Largest of PNS,communicate with other sinuses through lateral nasal wall.
- Horizontal Pyramidal shaped
  - Base
  - Apex
  - 4 walls

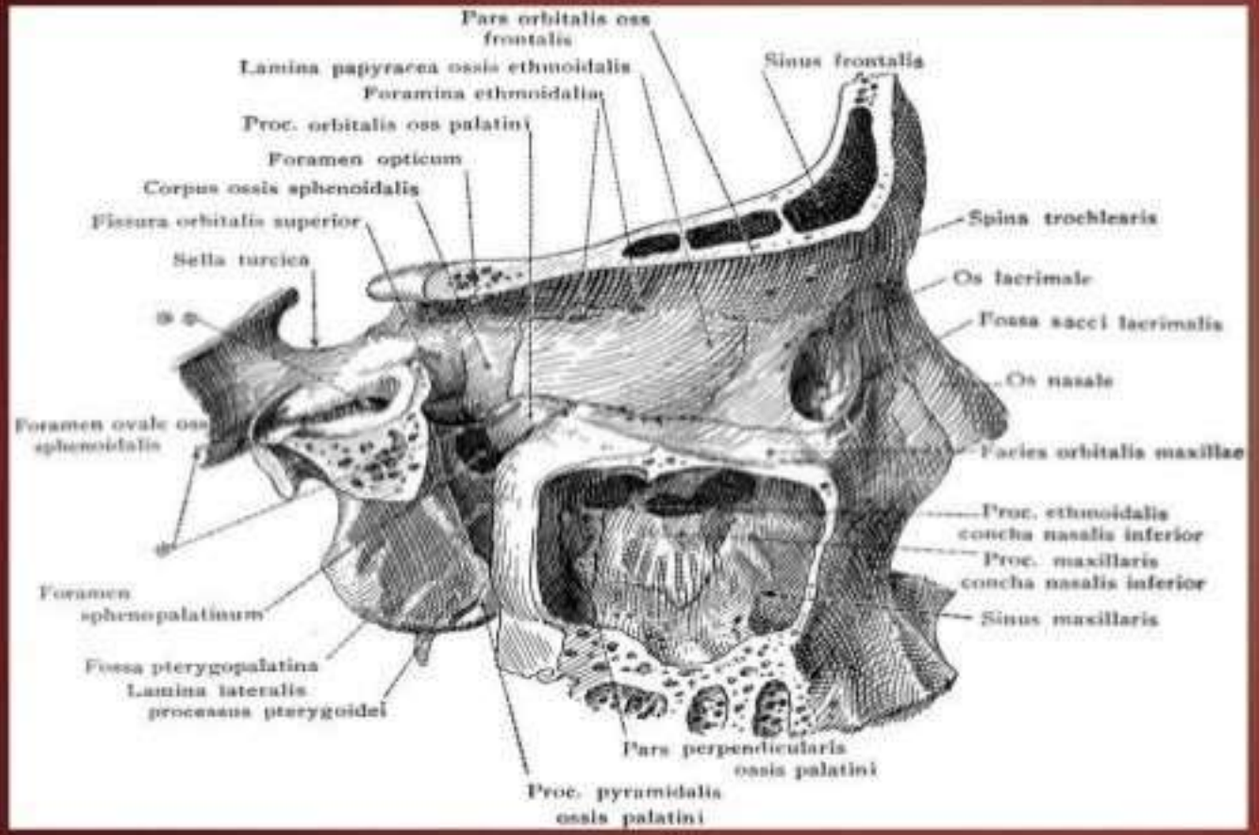
superior
inferior
lateral
anterior



- Wall thickness varies with

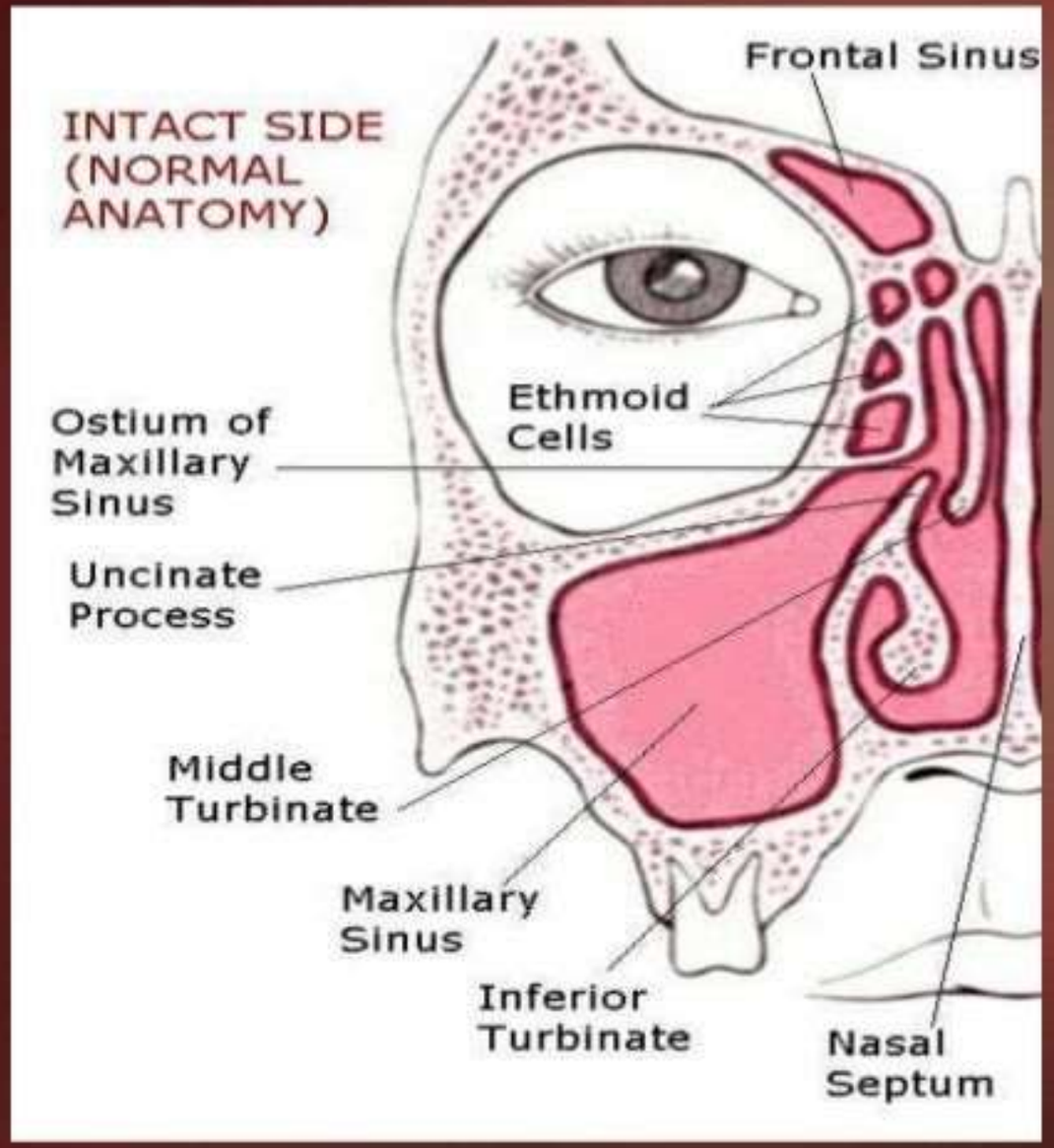
Medial wall

- Formed by lateral nasal wall
  - Below-inf . nasal conchae
  - Behind-palatine bone
  - Above-uncinate process of ethmoid,lacrimal bone
- Contains double layer of mucous membrane(pars membranacea)



Medial wall

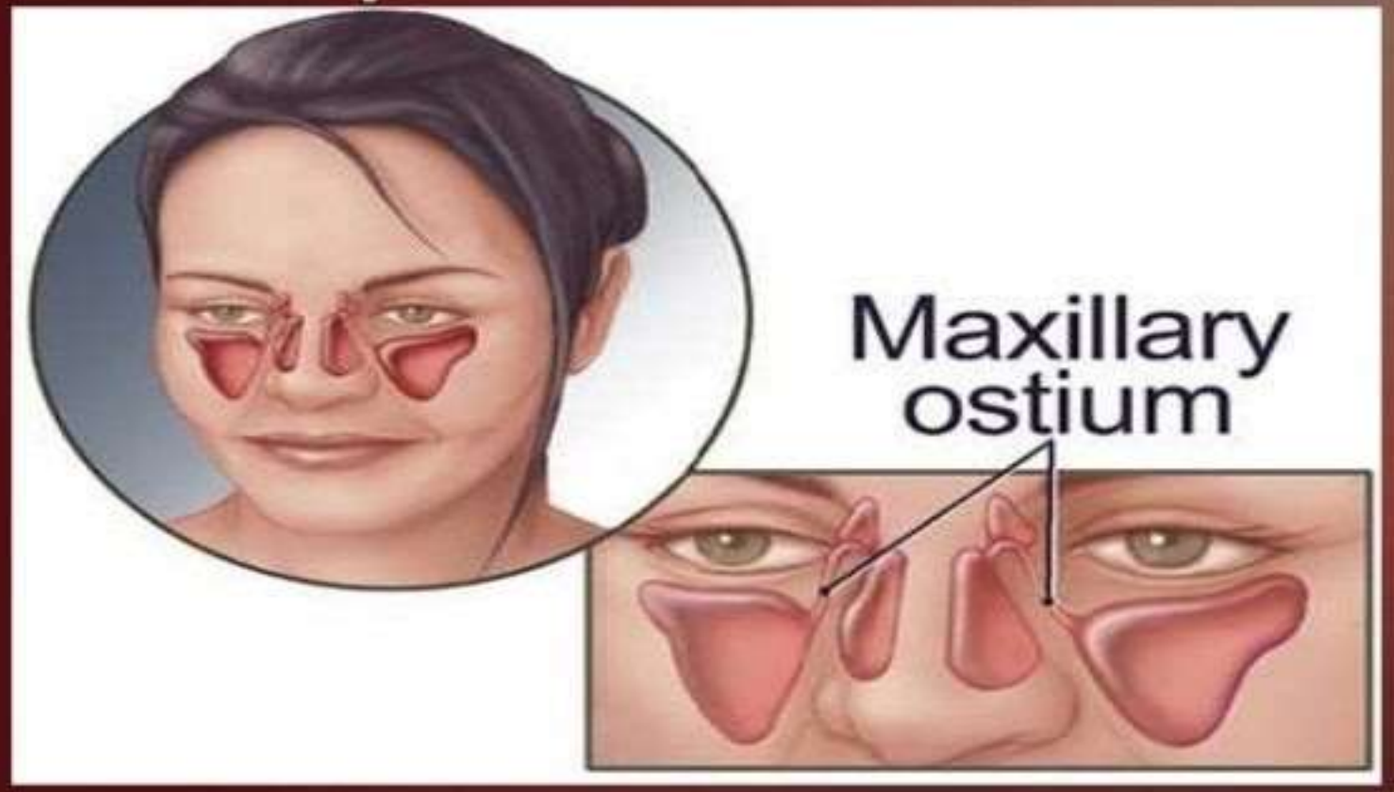
- Imp structures
  - Sinus ostium
  - Hiatus semilunaris
  - Ethmoidal bulla
  - Uncinate process
  - Infundibulum



Osteum:

- Opening of the maxillary sinus is called osteum.
- It opens in middle meatus at the lower part of the hiatus semilunaris.
- Lies above the level of nasal floor.

- The ostium lies approximately 2/3^{rds} up the medial wall of the sinus, making drainage of the sinus inherently difficult.



- In 15% to 40% of cases, a very small, accessory ostium is also found.

- Blockage of the ostium can easily occur when there is inflammation of the mucosal lining of the ostium.

Superior wall

- Forms roof of sinus and floor of orbit
- Imp structures
  - Infraorbital canal
  - Infraorbital foramen
  - Infraorbital nerve and vessels.

Posterolateral wall

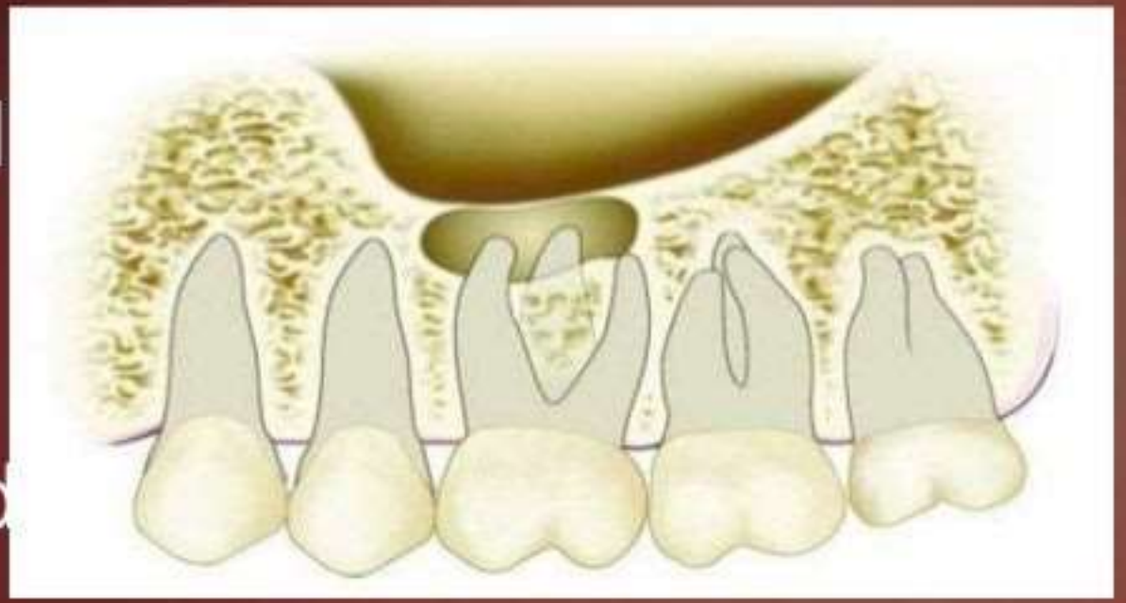
- Made of zygomatic and greater wing of sphenoid bone.
- Thick laterally,thin medially
- Imp structures
  - PSA nerve
  - Maxillary artery
  - Pterygopalatine ganglion
  - Nerve of pterygoid canal

Anterior wall

- Extends from pyriform aperture anteriorly to ZM suture
  & Inferior orbital rim superiorly to alveolar process inferiorly.
- Convexity towards sinus
- Thinnest in canine fossa
- Imp structures
  - Infraorbital foramen
  - ASA, MSA nerves

Floor of sinus

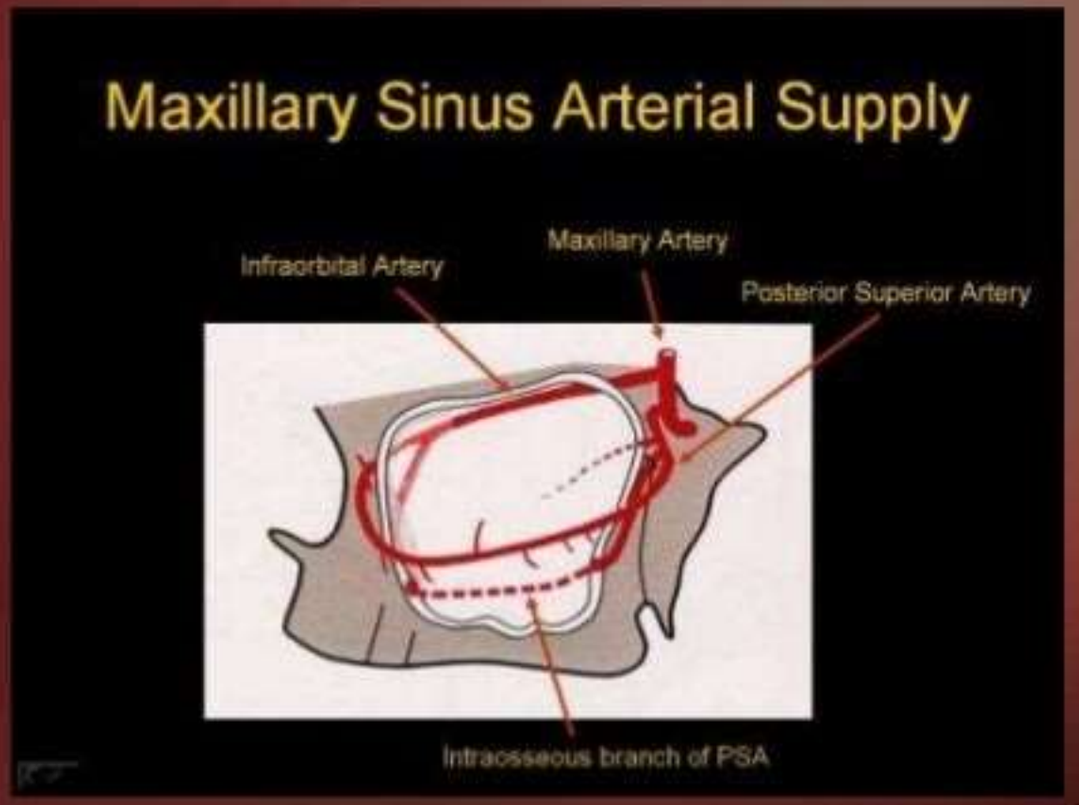
- Formed by junction of anterior sinus wall and lateral nasal wall
- 1-1.2 cm below nasal floor
- Close relationship between sinus and teeth facilitate spread of pathology.



VASCULAR SUPPLY:-

Arterial blood supply:-

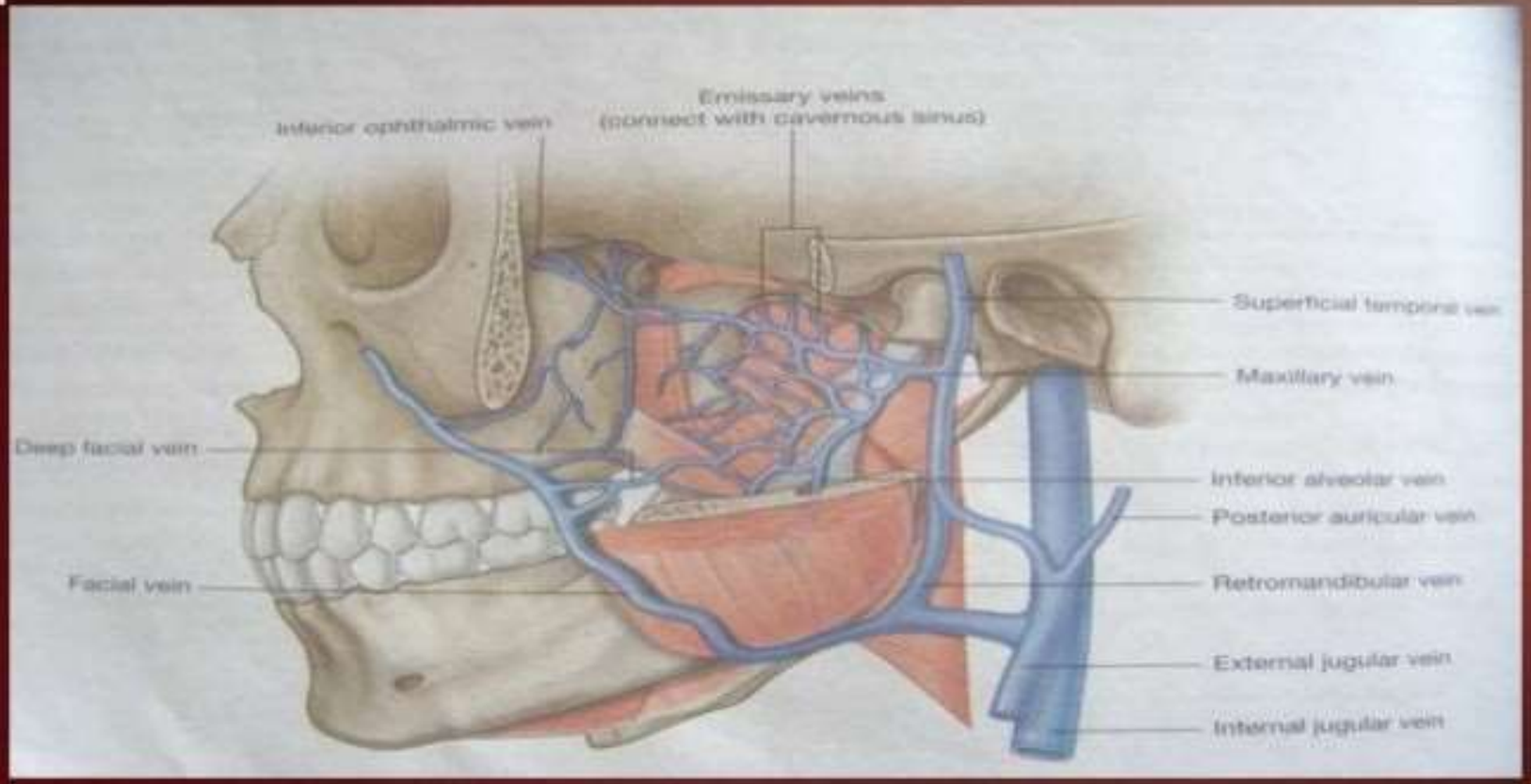
- Greater palatine arteries
- Infraorbital artery
- Facial artery



Venous drinage:-

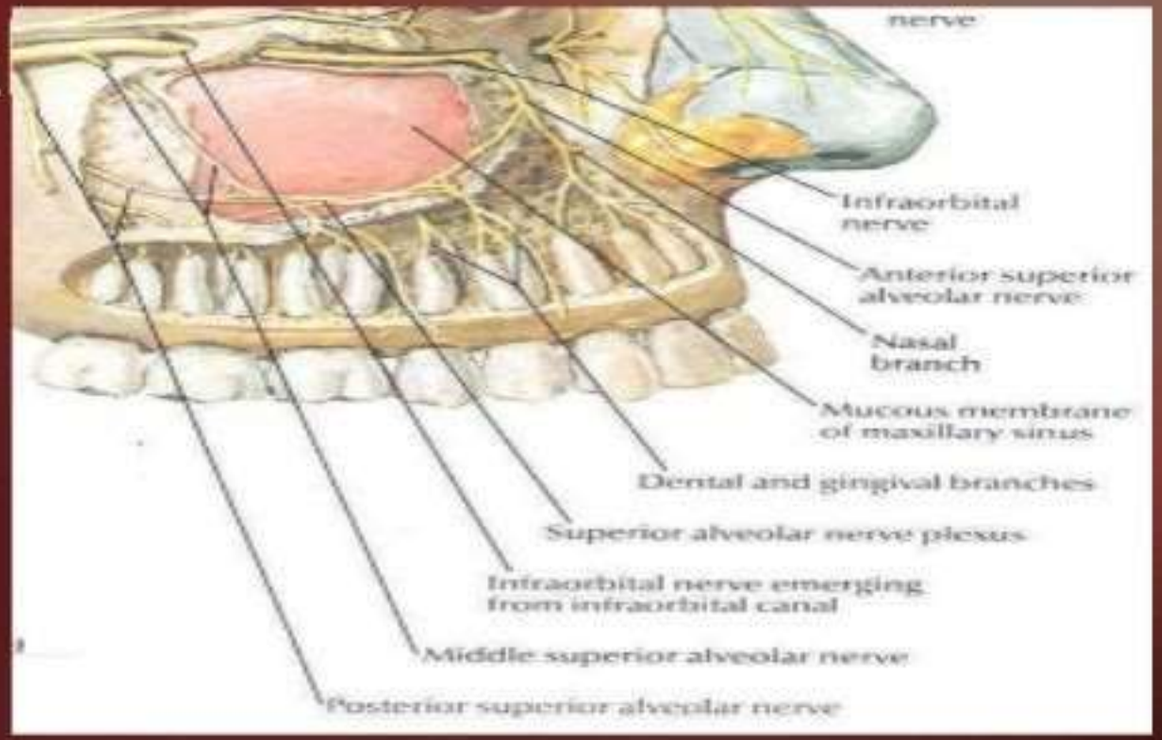
- Pterygoid venous plexus
- Sphenopalatine vein and
- Facial vein

(Watzek et al. 1997)



Nerve supply

- Maxillary division of the trigeminal nerve, i.e. the posterior, middle and anterior superior alveolar nerves, the infraorbital nerve and the anterior pa



Last 1959

Lymphatic Drain

- The lymphatic drains in to submandibular lymph nodes.

- The lymphatic drainage reaches the specialised cells in the maxillary sinus via infra orbital foramen or through the anterosuperior wall and then to the submandibular lymph nodes.

Lymphatic drainage

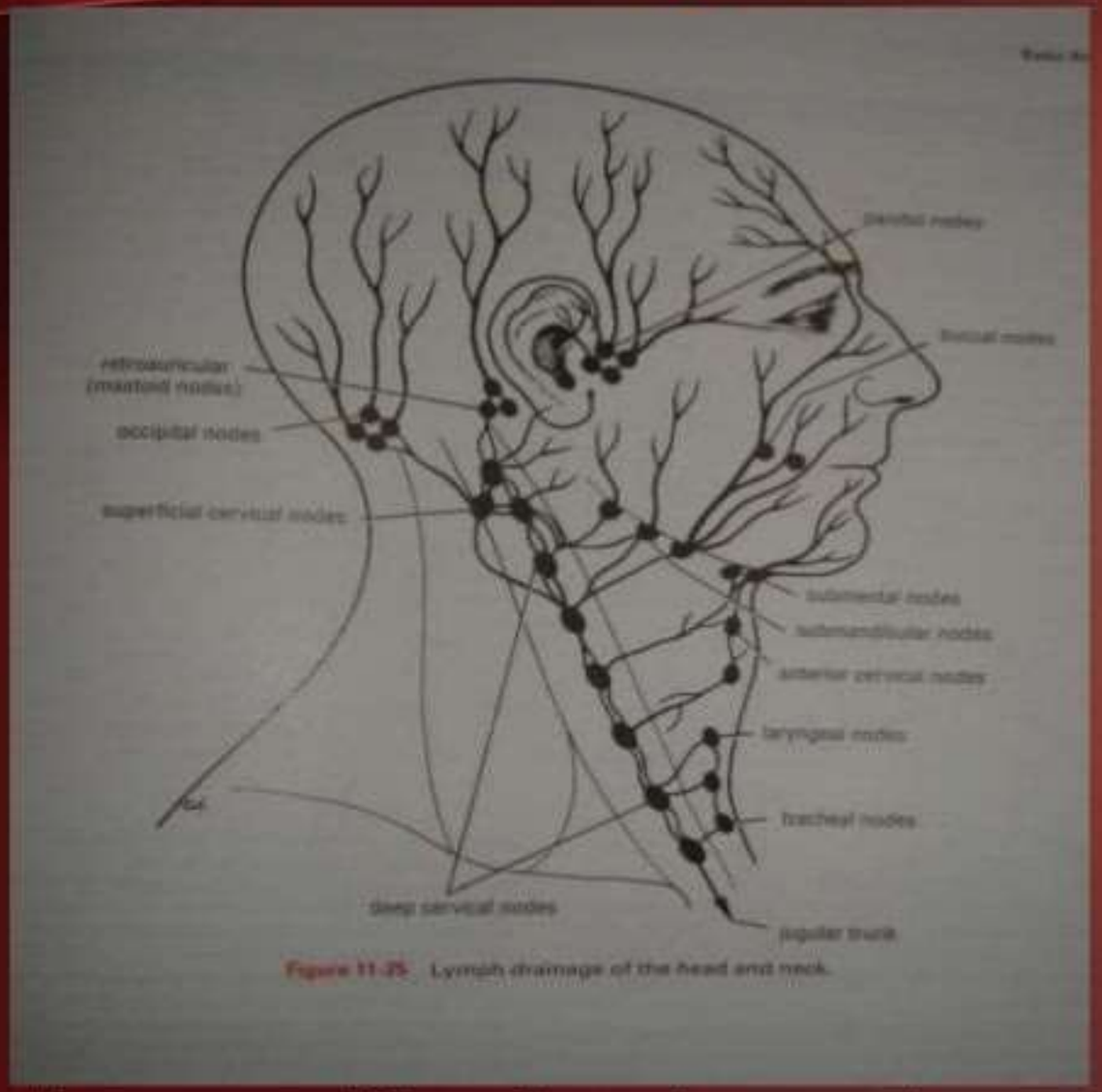


Figure 11.25 Lymph drainage of the head and neck.

Submandibular lymph nodes

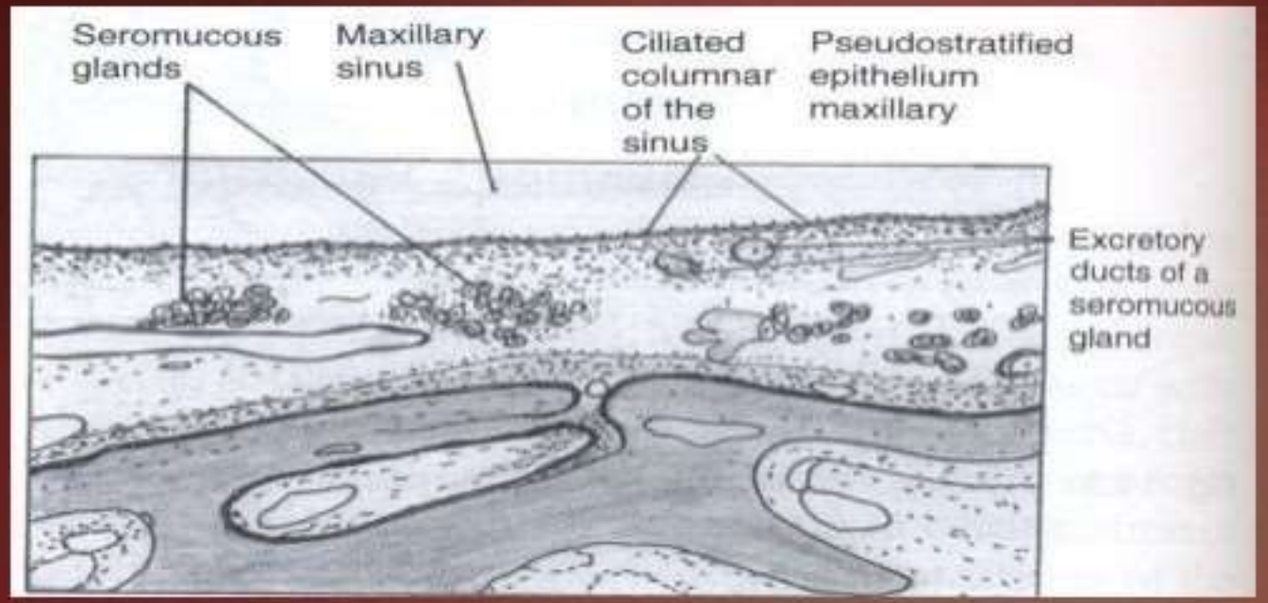
Functions of the maxillary sinus

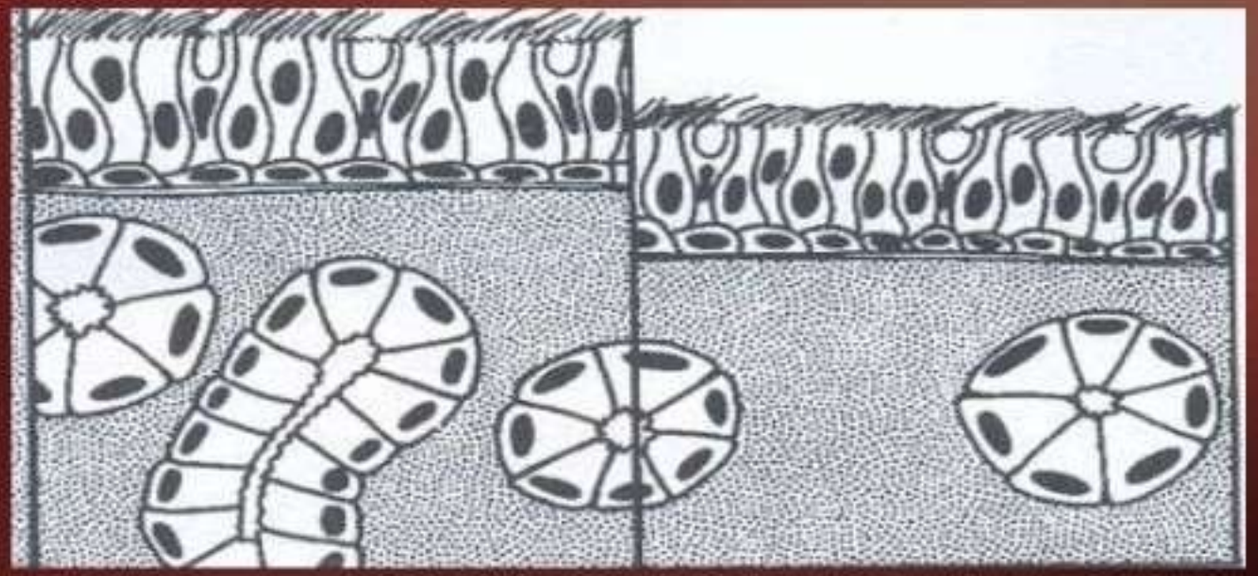
- Humidification and warming of inspired air,
- Assisting in regulating intranasal pressure,
- Lightening the skull to maintain proper head balance,
- Imparting resonance to the voice,
- Absorption of shocks to the head,
- Filtration of the inspired air.

(Bailey 1998).

HISTOLOGY

- Maxillary sinus is lined by three layers: epithelial layer, basal lamina and sub epithelial layer with periostium.
- Epithelium is pseudo stratified, columnar and ciliated.
- As cilia beats, the mucous on epithelial surface moves from sinus interior towards nasal cavity.





CLINICAL EXAMINATION

INSPECTION :

Middle third of the face should be inspected for the presence of asymmetry, deformity, swelling, erythema , ecchymosis or hemator

EXTRAORAL PALPATION :

Include palpation of the facial wall of the sinus above the premolar where the bone is thinnest.

INTRAORAL EXAMINATION

Examination should be performed for tenderness, or paresthesia of upper molar and premolar region.

TRANSILLUMINATION TEST:

It is performed in a darkened room by inserting an electrically safe light into the mouth (with the lip closed). Good transilluminati indicates presence of air in the sinus while the failure of transillumination indicates presence of pus, fluid , solid lesion or mucosal thickening.

Differences between symptom of odontalgia and sinus pain

- History of cold, allergy, congestion or nasal drainage.
- Dull aching pain that is difficult to localized
- Feel pressure in the cheek and below the eyes
- Position change like bending forward produces pain
- Dental local anesthetic blockade will not relief sinus pain
- Normal pulp vitality test.

Radiographic examination

- Radiography is the most important supplementary investigation to clinical examination of the sinuses

- **Intra-Oral** :
- Periapical
- Occlusal
-
- Lateral Occlusal view

Extra-Oral:

OPG View

Waters view

(Occipitomental view)

Submentovertex

PA view

Others:

- MRI & CT scan

Periapical radiograph

- Borders of the maxillary sinus appear as a thin, delicate radiopaque line .

(White & Pharoah 2000)

- In the absence of disease it appears continuous, but on close examination it has small interruptions in its smoothness or density.

- The roots of maxillary molars usually lie in close apposition to the maxillary sinus and may project into the floor of the sinus, causing small elevations or prominences.

(White & Pharoah 2000)

Maxillary sinus septum

Maxillary occlusal #2

1. nasal septum
2. nasal fossa
3. incisive foramen
4. retained root tip #11
5. maxillary sinus

Occlusal view

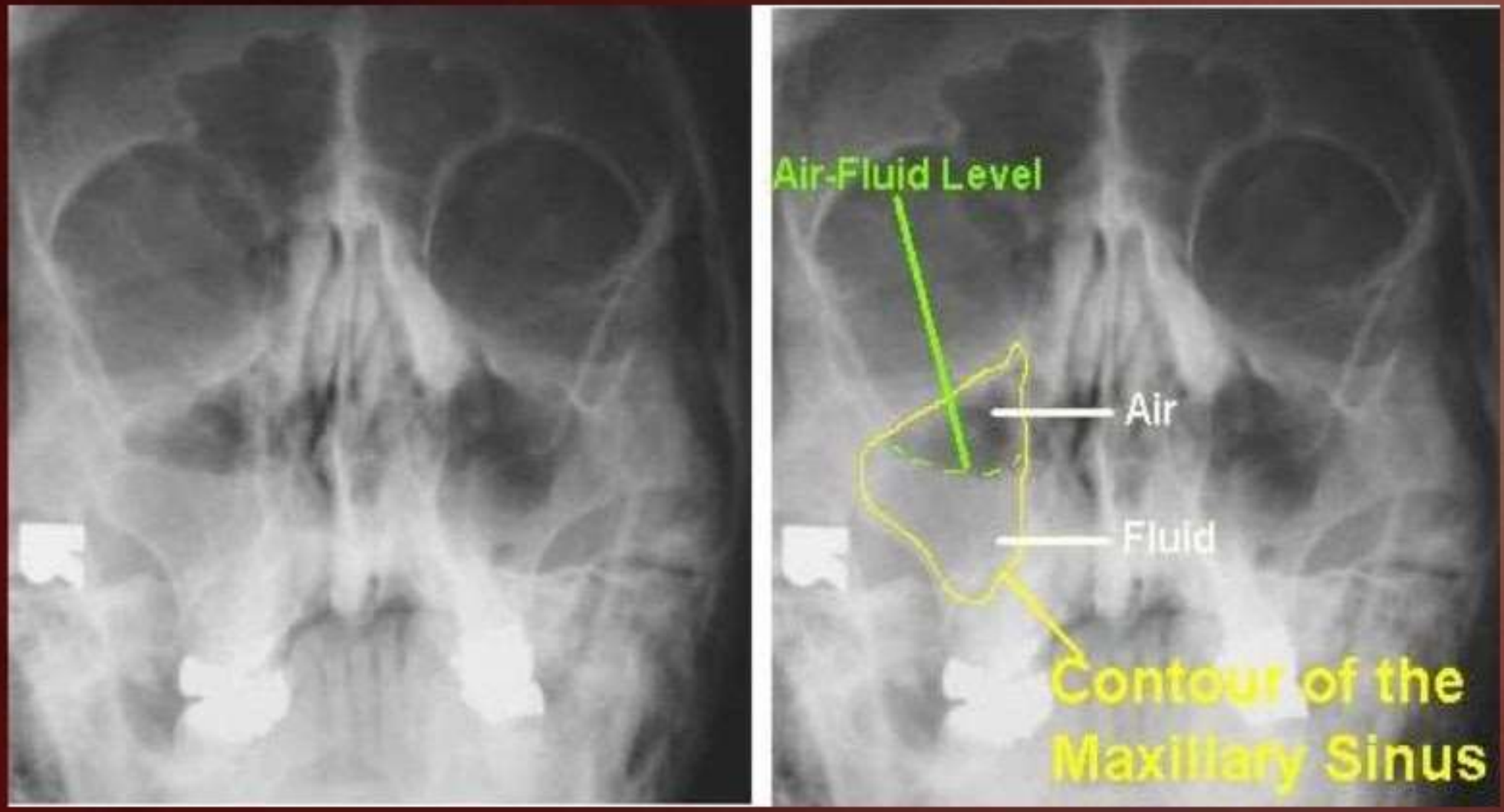
Lateral occlusal view

2. Panoramic radiography

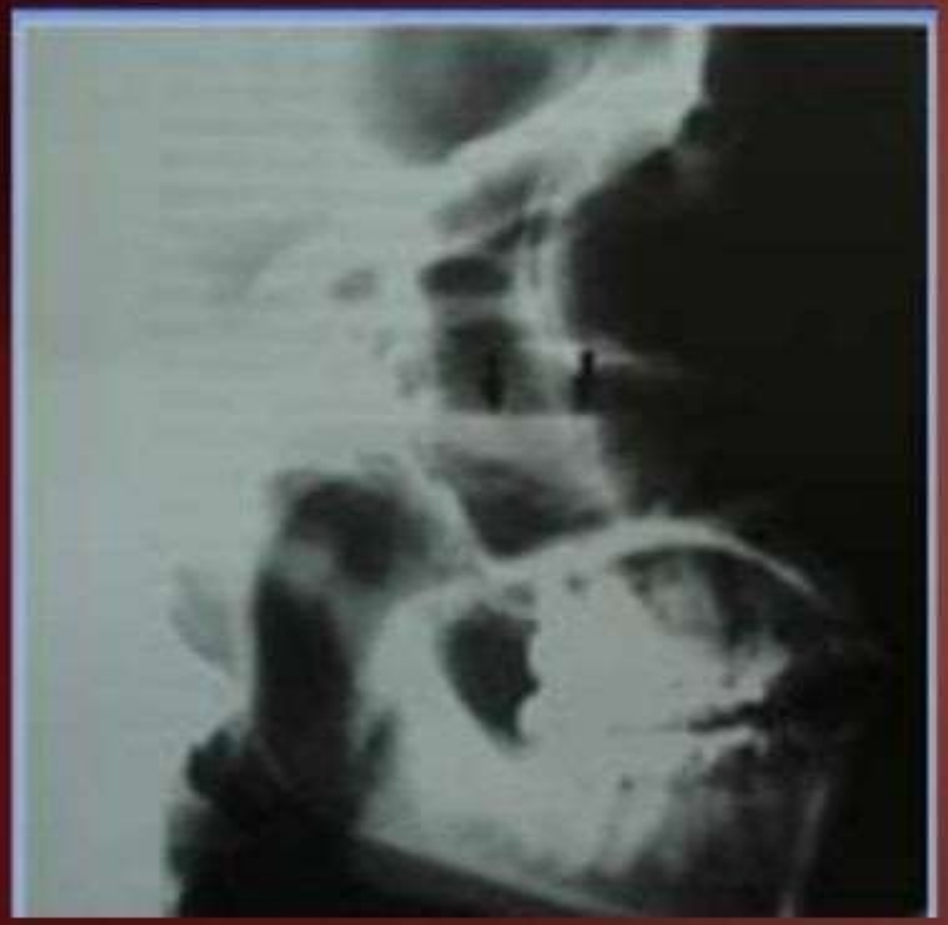
- Provides an extensive overview of the sinus floor and its relationship with the tooth roots.

OPG

Water's projection



PA view

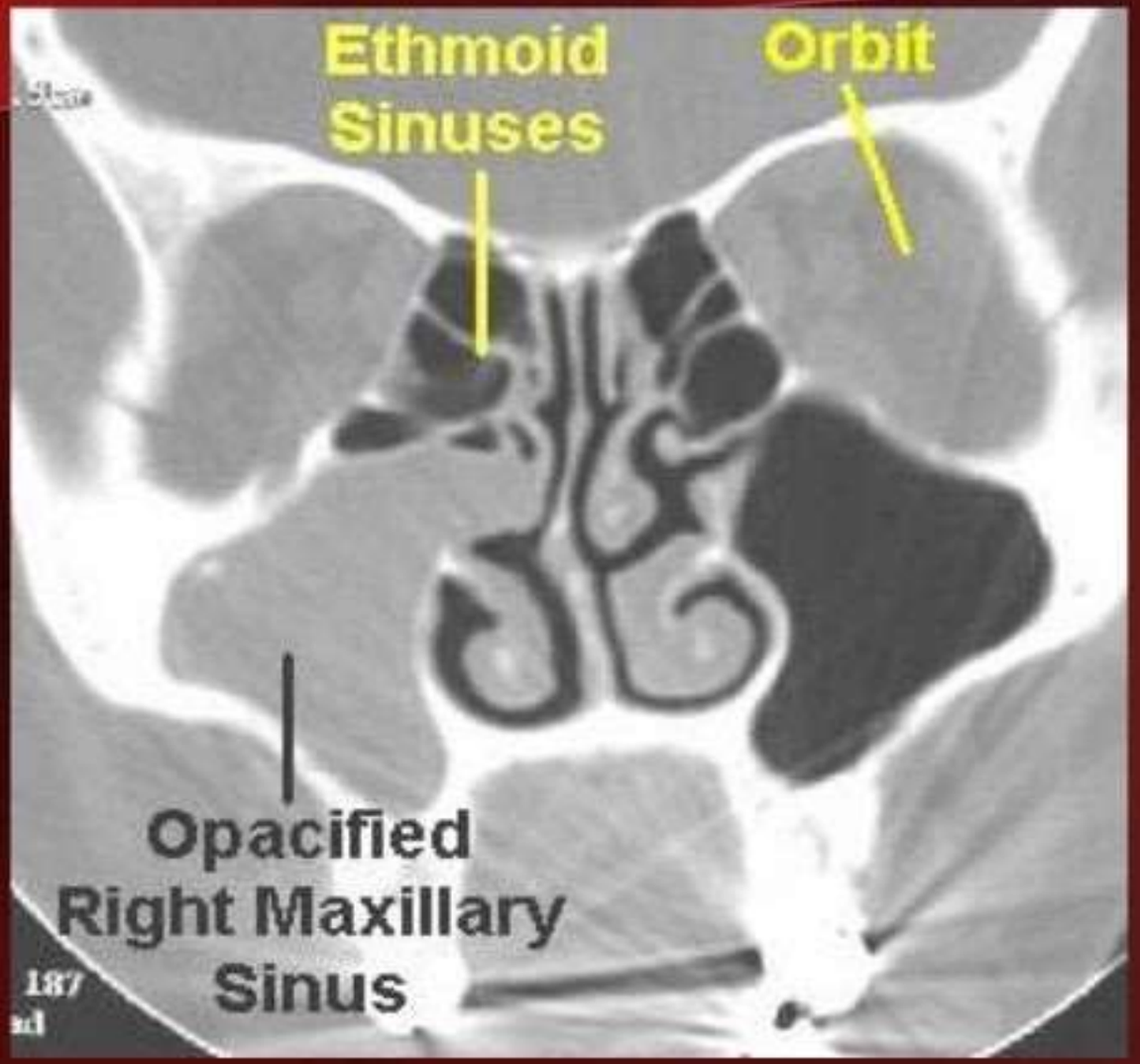


Lateral

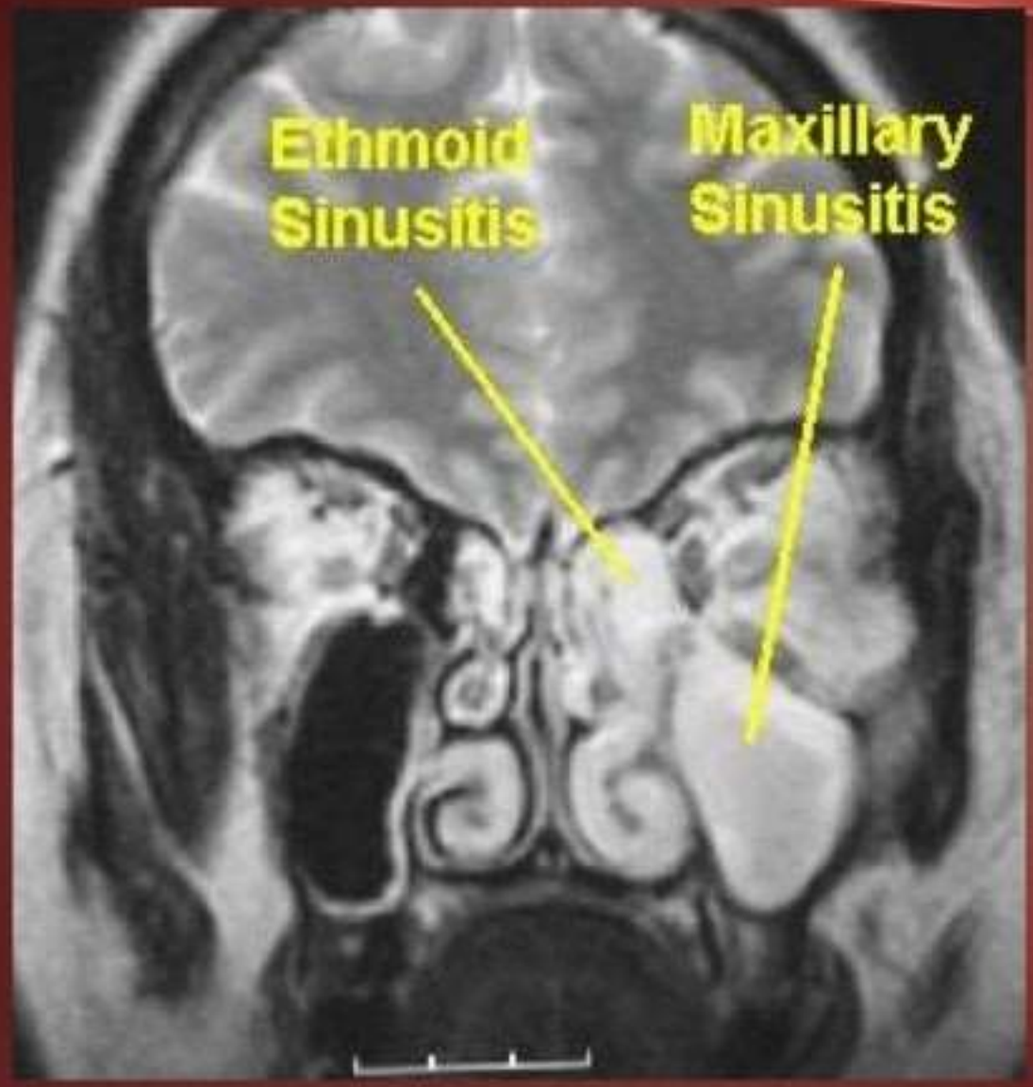
Submentovertex

5. Computerized tomography (CT) & Magnetic resonance imaging (MRI)

- These modalities provide multiple sections through the sinuses at different planes and therefore contribute to the final diagnosis and the determination of extent of the disease.


Ethmoid Sinuses
Orbit
Opacified Right Maxillary Sinus

CT scan


Ethmoid Sinusitis
Maxillary Sinusitis

MRI

6. Ultrasound

- Ultrasound is becoming the diagnostic tool of choice for more and more physicians in detecting sinusitis.
- It offers a fast ,reliable and radiation free method for diagnosing sinusitis and has been used successfully in Finland for around 15 years. (Landman 1986)

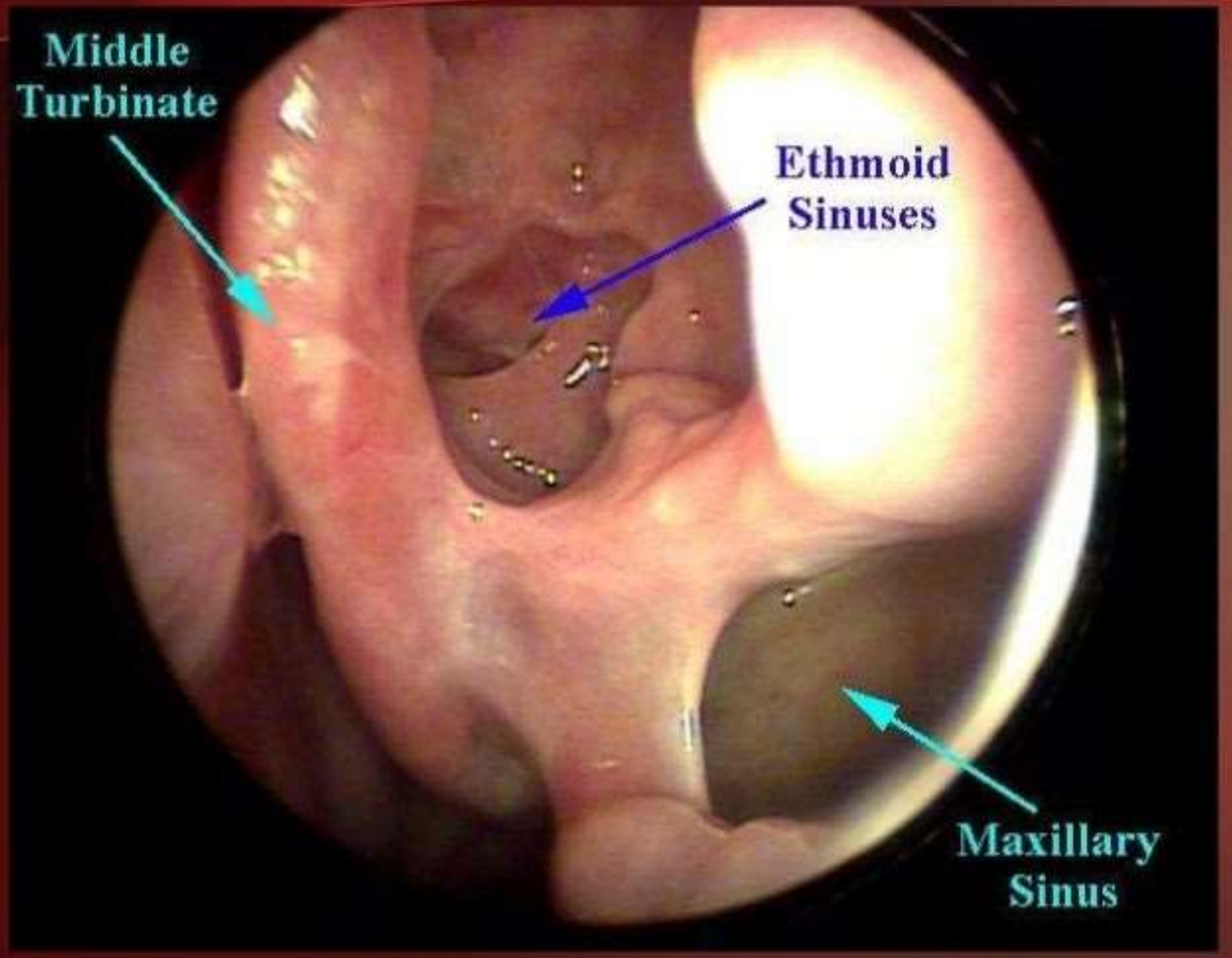
Ultrasound beam sent out by the sinus ultra is reflected fr
the posterior wall of the sinus when the sinus contains flu
and from the anterior wall when sinus contains air.

7. Diagnostic endoscopy

- It is an optimal method especially for the assessment of foreign bodies (such as root filling materials and root tips) that have penetrated into the maxillary sinus.

(Kennedy *et al.* 1985)

- Transoral access via the canine fossa.
- Transalveolar access via an already existing connection between the oral cavity and the antrum.
- Access the inferior meatus of the nose.


Middle
Turbinate
Ethmoid
Sinuses
Maxillary
Sinus

DEVELOPMENTAL ANOMALIES AND PATHOLOGIC CONDITIONS OF MAXILLARY SINUS

Developmental anomalies

1. Aplasia
2. Agenesis
3. Hypoplasia

Aplasia

Pathologic conditions of maxillary sinus

- Maxillary Sinusitis
- Odontogenic cystic lesions of maxillary sinus
- Tumors of maxillary sinus.

Maxillary Sinusitis

Acute Maxillary Sinusitis

- Sudden onset
- Duration of 4wks or less

Subacute Maxillary Sinusitis

- Duration of 4 – 12 wks

Chronic Maxillary Sinusitis

- Duration of atleast 12 wks

Maxillary sinusitis

Etiology

1. Infectious causes

a) Bacterial

b) Viral

c) Fungal

2. Non infectious causes

a) Allergic

b) Non allergic

c) Pharmocologic

d) Irritants

3. Disruption of mucociliary drainage

a) Surgery

c) Trauma

Maxillary sinusitis

Signs and symptoms associated with maxillary sinusitis	
Major signs and symptoms	Minor signs and symptoms
Facial pain/pressure	Headache
Facial congestion/fullness	Fever
Nasal obstruction/blockage	Halitosis
Nasal discharge/purgulence/discolored postnasal discharge	Fatigue
Hyposmia/anosmia	Dental pain
Purulence in nasal cavity on examination	Cough
	Ear pain

Maxillary sinusitis of Dental Origin

1.Dental abscess(periodontal and periapical abscess)

2.Infected dental cyst

3.Dental material

4.Oro-antral communication

Spread of infection from periapical region .

Overextention of dental material like sealers, cements ,Gp or silver cones

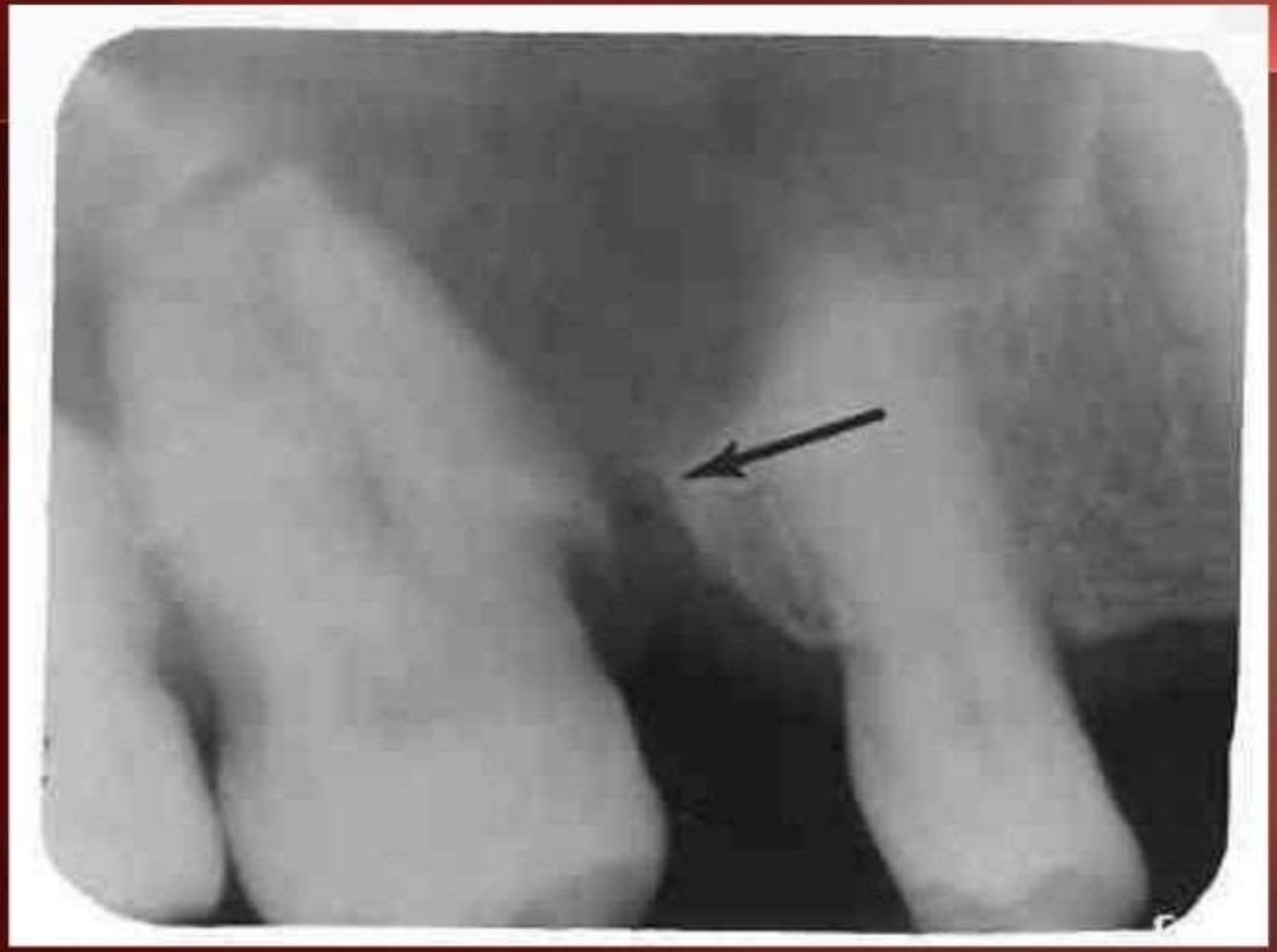
A root tip of the maxillary first molar accidentally pushed into the sinus at the time of tooth extraction.

Oro-antral communication

(It is a pathologic tract that connects the oral cavity to the maxillary sinus.)

- Maxillary sinus perforation occurs occasionally during the extraction of a maxillary tooth, and it may be a cause of maxillary sinusitis or oro- antral fistula.

- Patient complained of regurgitation of food through the nose while eating.



ODONTOGENIC CYSTIC LESIONS AFFECTING THE MAXILLARY SINUS

Odontogenic Cystic Lesions of the maxilla

-Radicular cyst

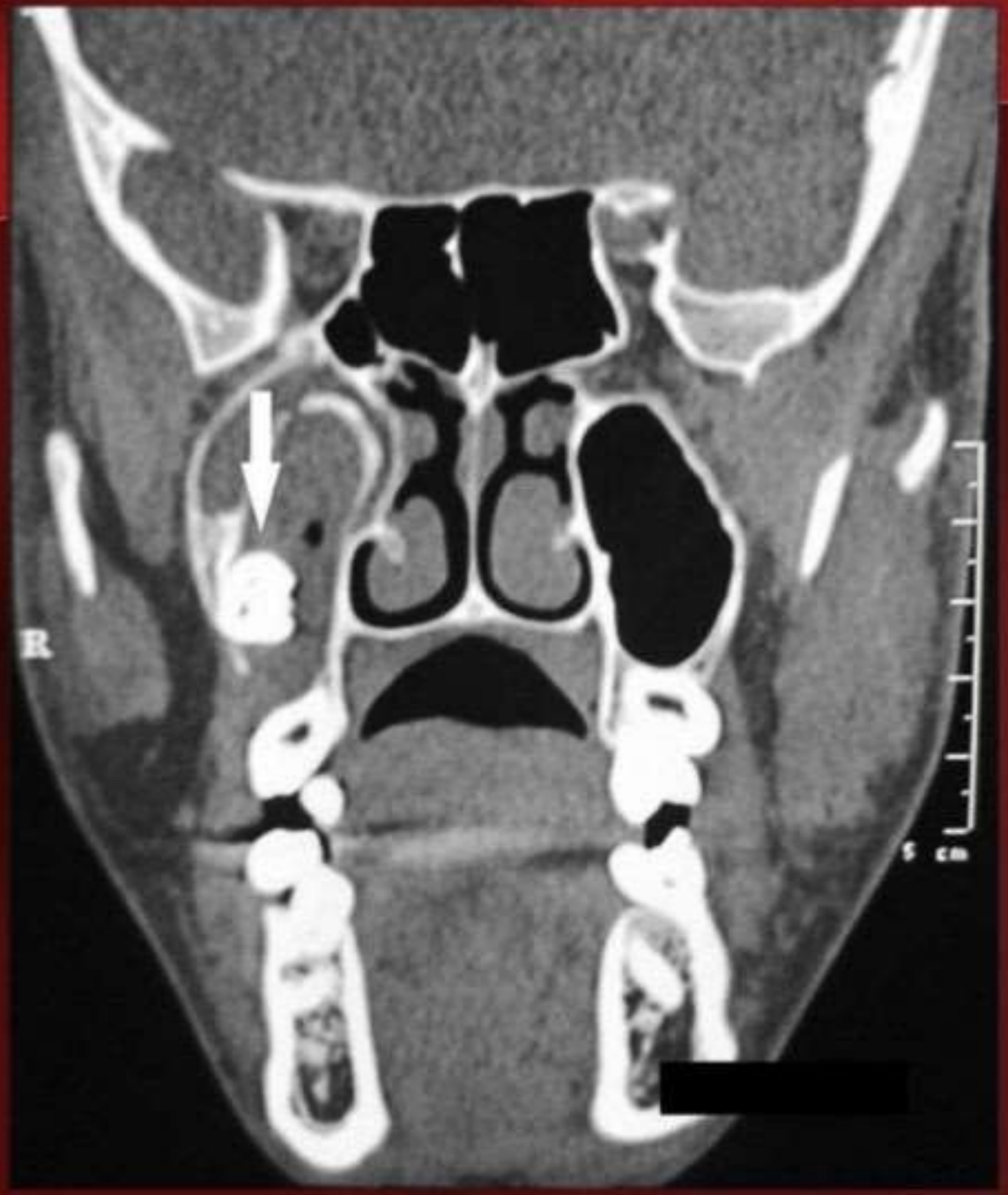
-Dentigerous cyst

-Mucous retention cyst

Radicular cyst

Maxillary sinusitis caused by an apical inflammatory lesion (radicular cyst) at the root apices of the 2nd molar

- **NOTICE** the cloudiness (Radio-opacity) of the sinus



Dentigerous cyst

Also known as follicular cyst,2nd most common cyst , it usually appear on the impacted maxillary 3rd molar

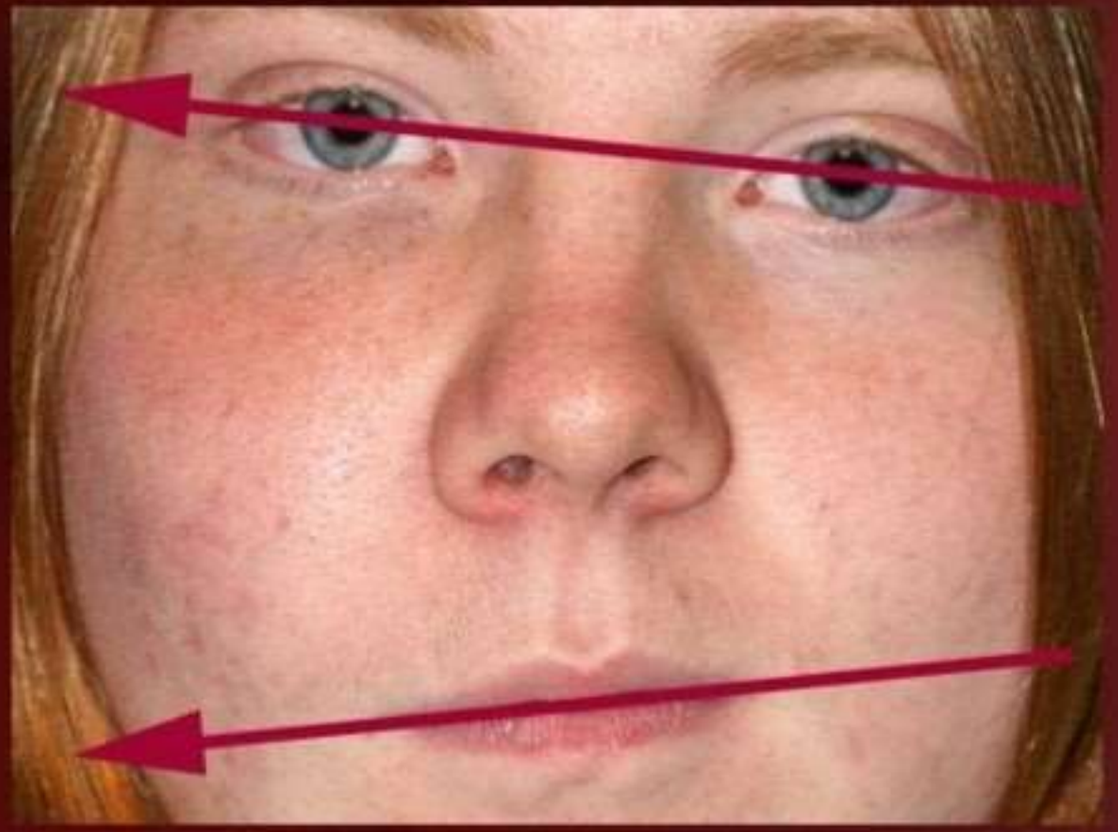
Mucous retention cysts

Mucous retention cysts in the sinuses are very common, they are expansile and potentially destructive lesions

TUMORS OF MAXILLARY SINUS

Benign tumor of MS:

- **Ameloblastoma:**
- Ameloblastoma is the most common benign tumor affecting maxillary sinus.



Malignant tumors of MS

- They are Invasive and destructive lesions
- For Examples :
- Squamouse cell carcinoma

Clinical Considerations:

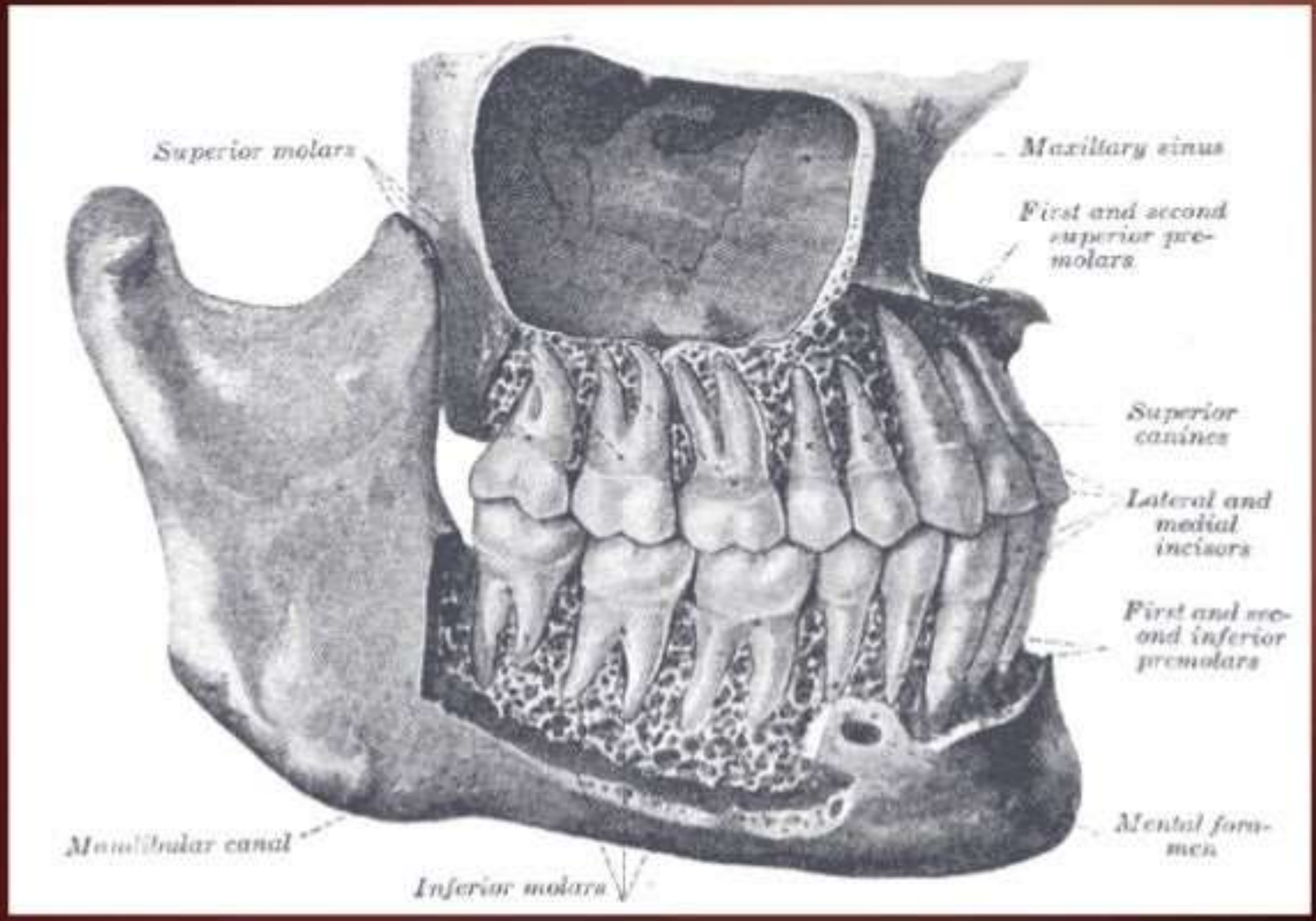
Oro-antral communication and oro-antral fistula

- Maxillary sinus perforation occurs occasionally during the extraction of a maxillary tooth, and it may be a cause of maxillary sinusitis or oro- antral fistula.

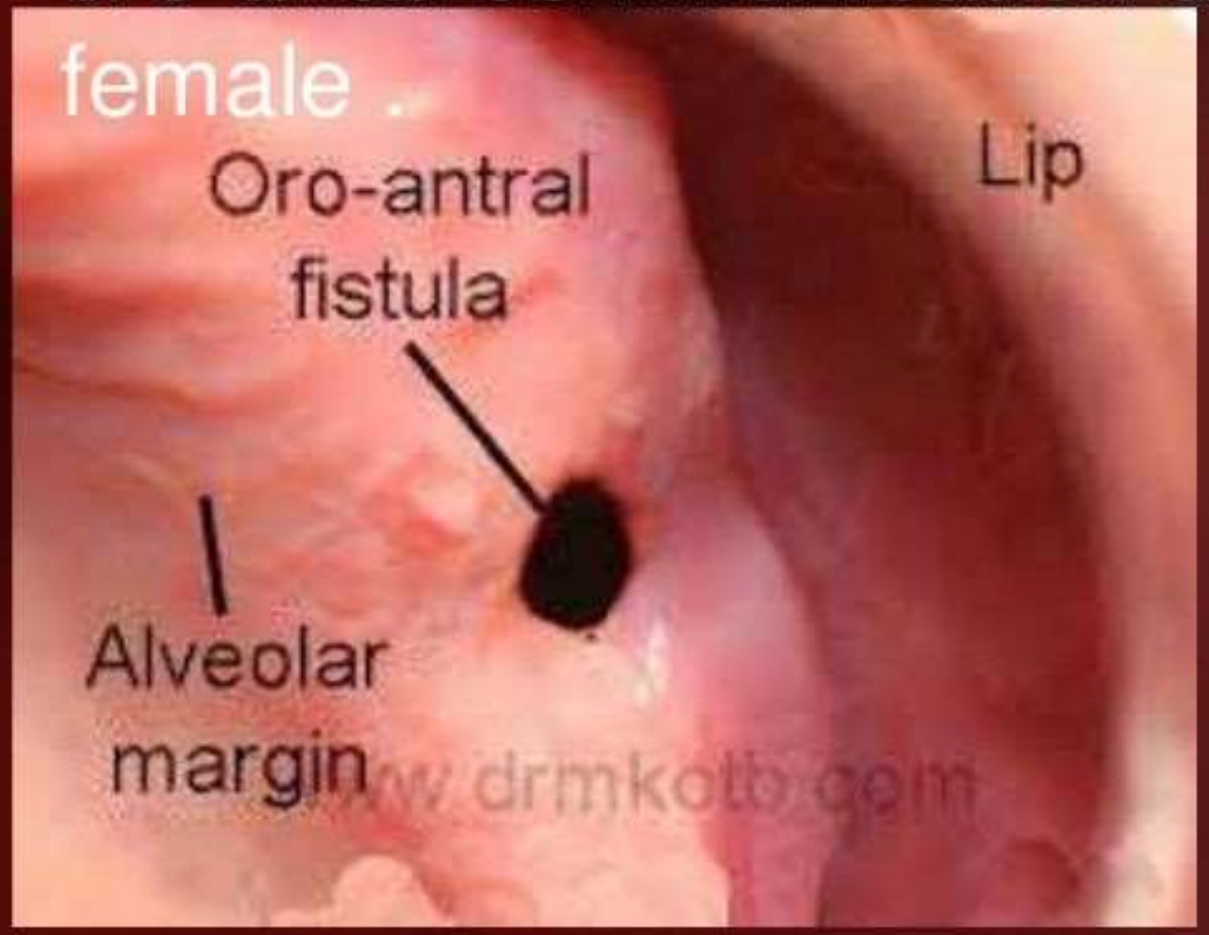
- The chances of creating an oro-antral fistula in patient less than 15 yrs are comparatively lesser than in adults due to incomplete development of sinus.
- The distance between apical end of maxillary posterior teeth and floor of sinus is approximately 1-1.2 cm. In some cases the gap may be still lesser.

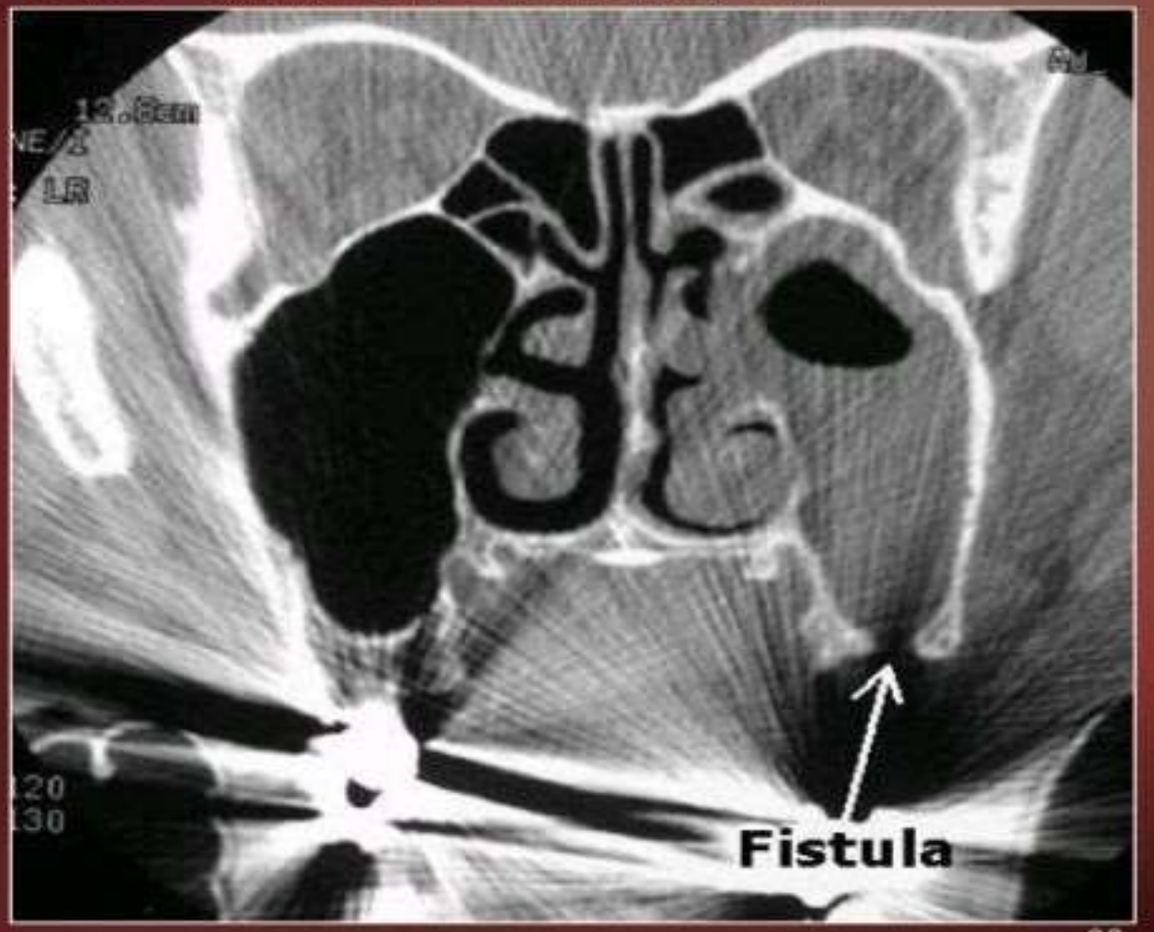
- Root which is most close to the sinus is “palatal root of maxillary 2nd molar

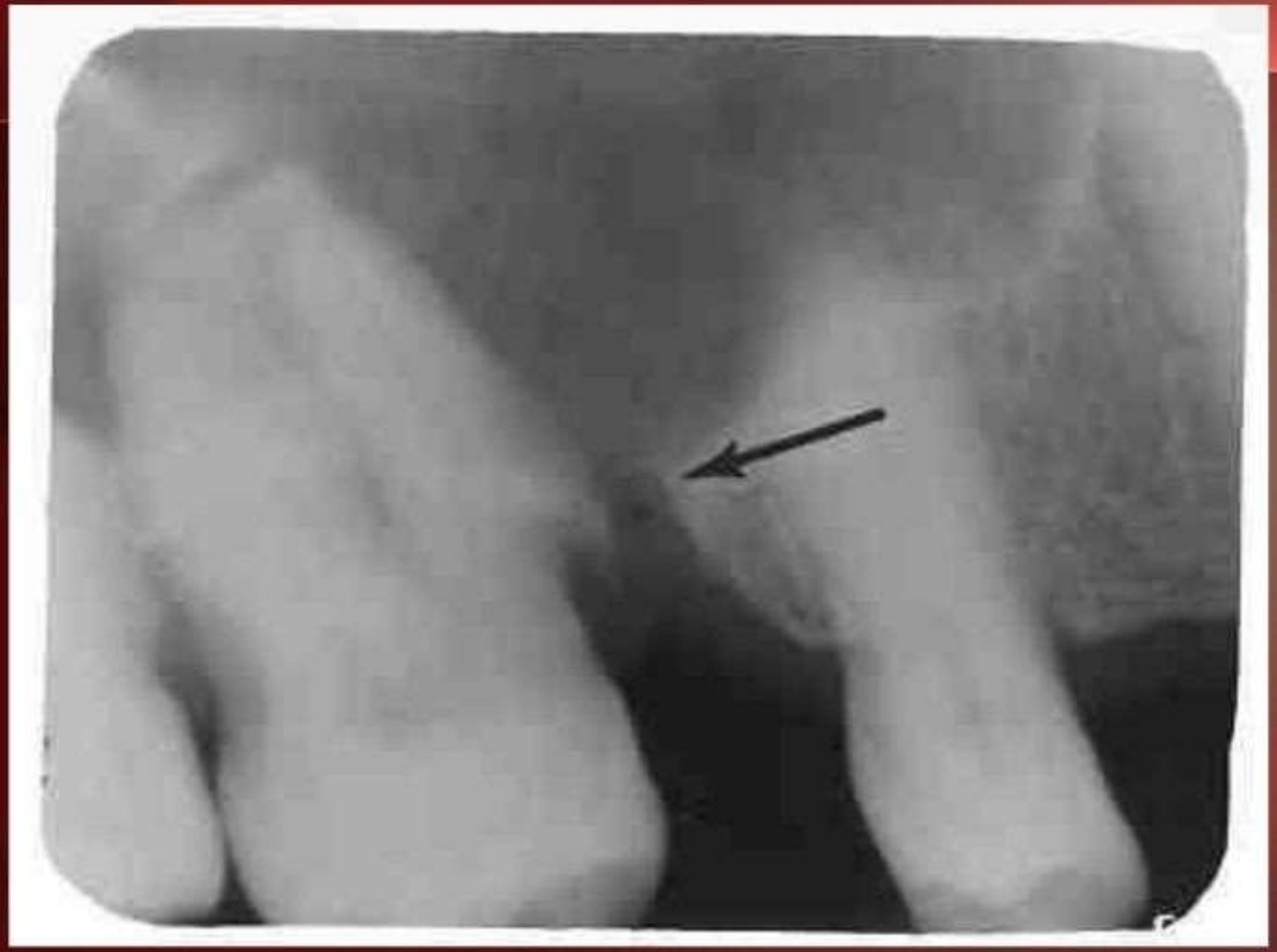
- Followed by :
- 1st molar
  3rd molar
  2nd premolar
  1st premolar
  canine



- Lin et al. in 1991 reported that the maxillary sinus is more developed in female and therefore greater possibility of the occurrence of oro-antal communication and oro-antral fistula in female .







Symptoms of fresh oroantral communication:

Escape of fluids

Epistaxis

Escape of air

Enhanced column of air.

Excruciating pain

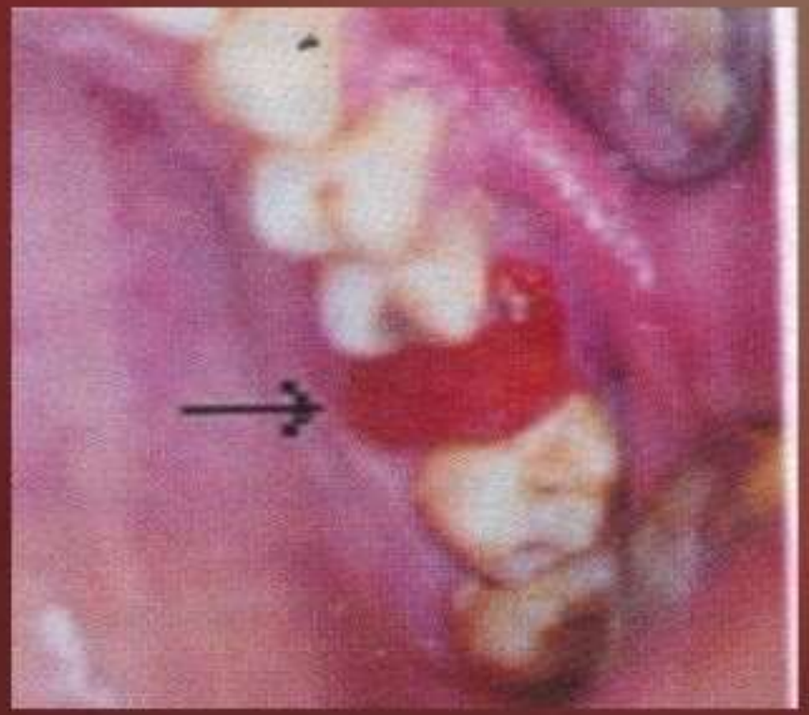
Symptoms of established oroantral fistula:

Pain.

Persistent purulent unilateral nasal discharge.

Post nasal drip.

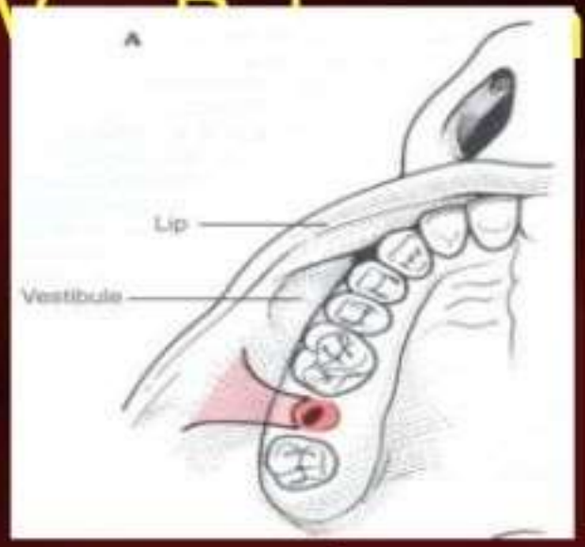
Popping out of antral polyp.

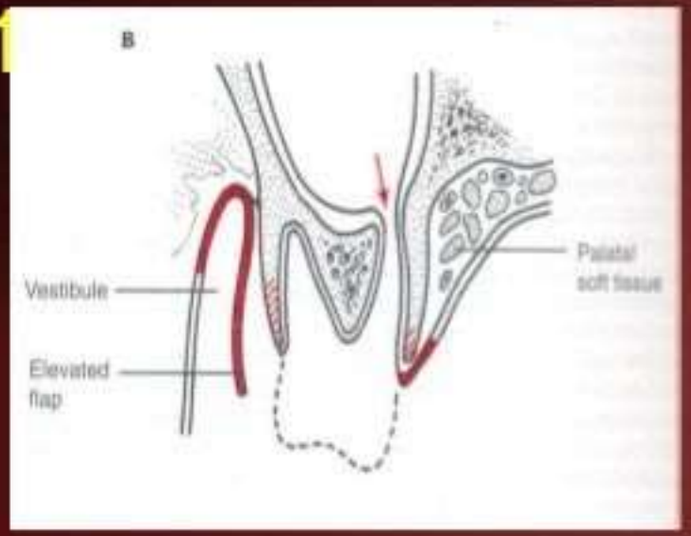


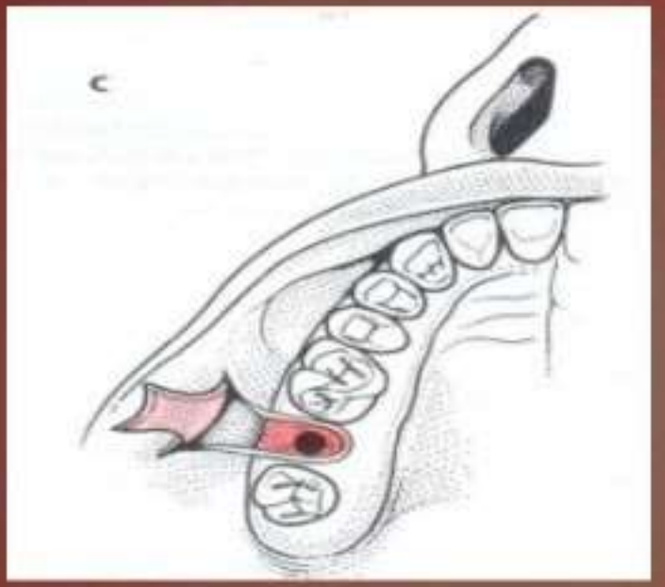
Operative technique

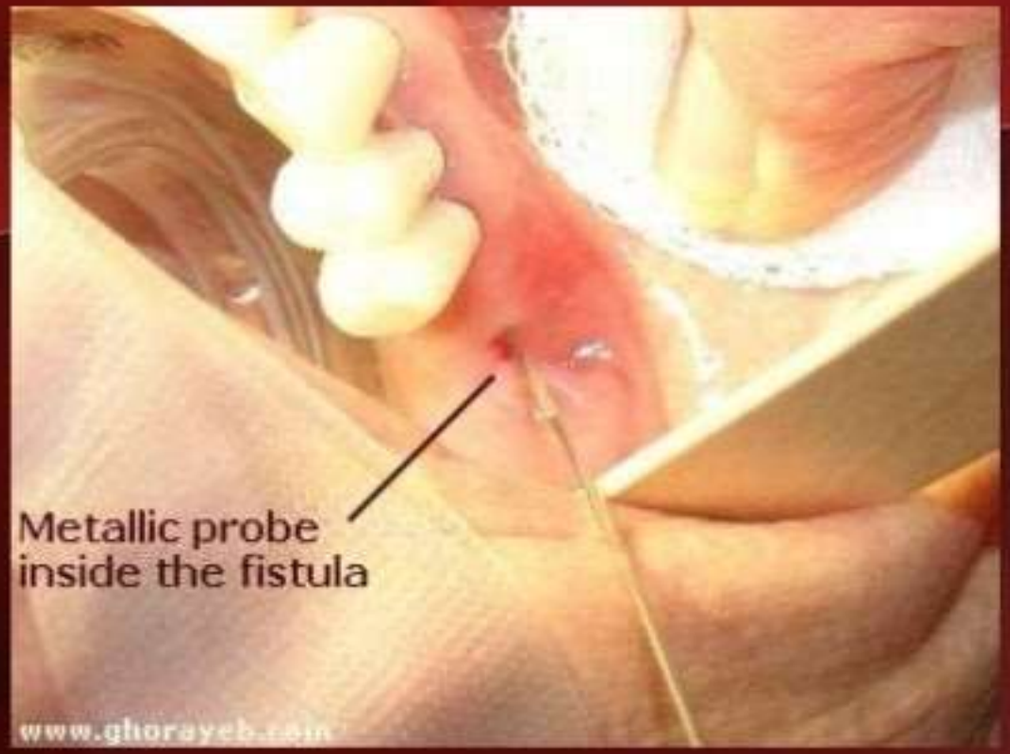
Buccal flap advancement operation

- Von Rehrmann - 1





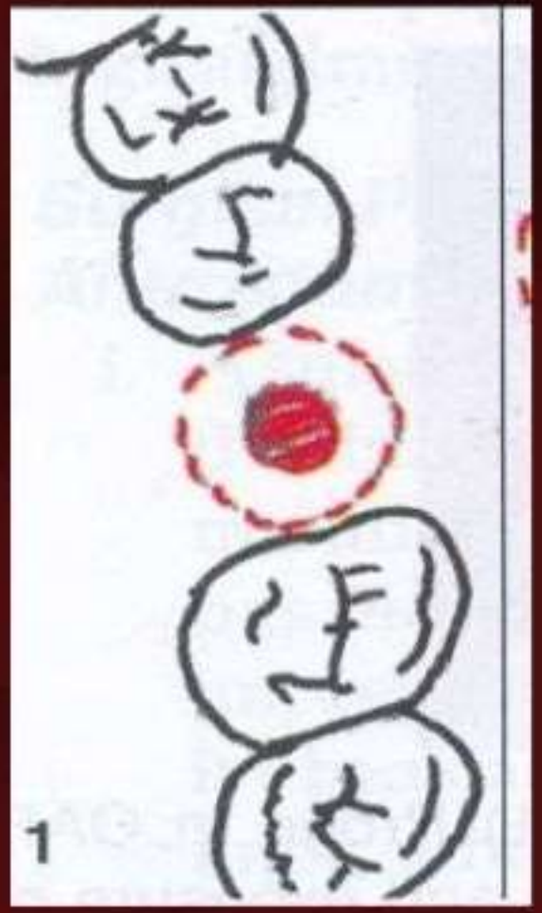



Metallic probe
inside the fistula
www.ghorayeb.com

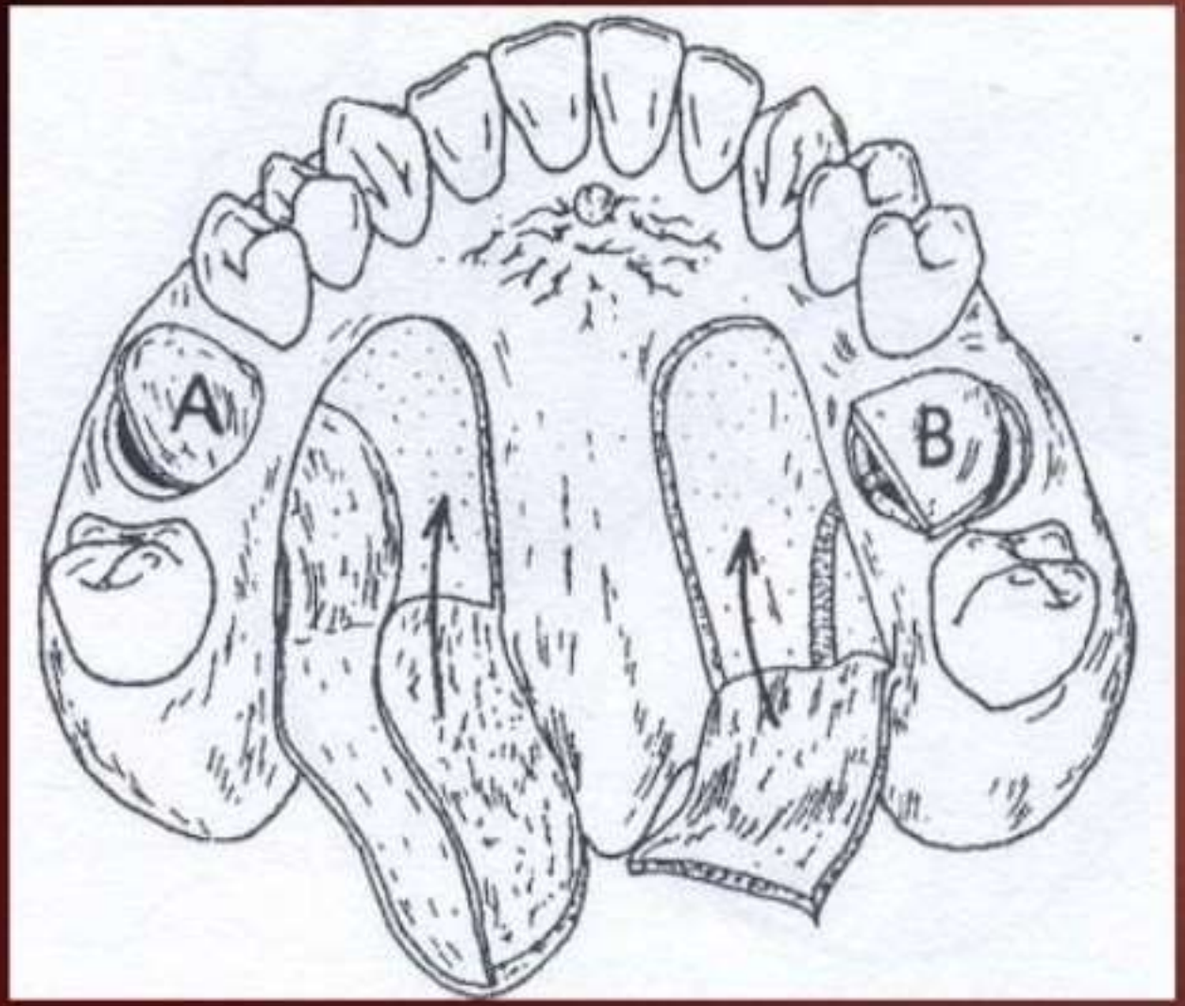

Buccal mucosa flap
elevated
Oro-antral fistula


Buccal mucosa
advancement flap
covering bony defect
in floor of antrum
www.indiandentalacademy.com
www.ghorayeb.com

PALATAL FLAPS
Rotational-advancement.(Ashley 1939)



SUBMUCOUS CONNECTIVE TISSUE FLAP(Ito et al 1980)



BUCCAL FAT PAD(Hanazawa et al 1995)


THANK YOU